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Sixth Biennial Report

State of Louisiana

Wild Life and Fisheries Commission

1954 - 1955

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SIXTH
BIENNIAL REPORT

Louisiana
Wild Life and Fisheries Commission
1954 - 1955

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Wild Life and Fisheries Commission
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Director and Seven-Member Commission

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Table of Contents

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PAGE

Administration 1

Division of Commercial Seafoods 7

Division of Education and Publicity 17

Division of Enforcement 24

Division of Fish and Game 35

  Federal Aid Section 68

Division of Fur and Refuge 114

Division of Oysters and Water Bottoms 134

Division of Water Pollution Control 161

Accounting and Revenue 169

Financial Report 182

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State of Louisiana

L. D. YOUNG, JR
DIRECTOR

WILD LIFE AND FISHERIES COMMISSION
126 CIVIL COURTS BLDG
NEW ORLEANS 16

May 1, 1956

TO THE GOVERNOR AND MEMBERS OF THE
LOUISIANA LEGISLATURE

Gentlemen:

Accompanying this letter is the Biennial Report of the activities of the Louisiana Wild Life and Fisheries Commission, covering the calendar years ending December 31, 1954 and December 31, 1955.

It is with a sincere sense of pride that the Commission submits this report of its activities and accomplishments. Progress in wildlife conservation is evident and the people of Louisiana are reaping benefits from this long-range program.

Respectfully submitted,

L. D. Young, Jr.,
Director.

Director L. D. Young, Jr.

Administration

Managing Louisiana's wildlife resources under the Commission form of administration has brought about improvements in the game, fish and furbearer habitats, an increase in the supply and demands of fishes, both commercially and sportswise, marked law enforcement betterment, control of pollution in our streams, opening of new areas to public hunting and research programs to prove that scientific knowledge, together with common sense, give the answers to the problems facing, not only our sportsmen, but our game and fish species—from Lake Providence to Cameron and from Shreveport to New Orleans.

No area has been singled out for special consideration, but efforts of the Commission and its personnel have been broadened to include every parish within this diversified state.

A few of the highlights of the past three years include:

Enforcement: Effective enforcement of Louisiana's fish and game laws by well-trained, devoted personnel is reflected in the records. No other period in Louisiana history can be said to have come close to the enforcement accomplishments of the Commission during the past three years. Uniformed, well-equipped and efficient law enforcement officers have gained the respect, confidence and support of the citizenry of Louisiana.

Pollution: For the first time in years, many of Louisiana's streams and lakes are free of discharges of waste matters which resulted in wholesale fish kills. This has come about by firm insistence that corrective measures be taken by those in violation of pollution regulations, and the fullest cooperation of industry in almost every instance. A good example is the successful ending of pollution of our streams by sugar mills. With one or two minor exceptions, the sugar grinding season just ended found no damaging wastes going into the state's waters. Much of the credit must go to the owners of sugar factories. Several hundred thousands of dollars were expended by them in corrective measures. Effluents from other industries and oil fields which add to the state's pollution problems, have been reduced and in many cases entirely eliminated.

Public Hunting: The Commission's effort to offset the diminishing opportunity for the average citizen to go afield in search of game, has resulted in the opening of some 347,000 acres of public hunting grounds. Hundreds of duck hunters at Pass-a-Loutre, deer and quail hunters at Red Dirt and other game management areas have only praise for this program.

Research: Upland game, and sport and freshwater commercial fishing research programs have been augmented and continued. Notable strides have been made in saltwater research. Marine research projects which will benefit oyster, shrimp and commercial fish industries are well underway. It is generally conceded that more progress favoring commercial fisheries has been made since the Commission became a reality than ever before.

Sport fishing and hunting ring cash registers to the tune of $60,000,000 a year in Louisiana and these activities, along with the giant commercial fishing industry, rank second only to the fabulous oil industry.

The ever expanding commercial-wise operations in Louisiana today are valued at $265,955,180 and are means of livelihood for 303,928 persons. Not considering the wholesaler and retailer, products of the fishing industry are worth $61,053,216 to the producer, with the $28,000,000 shrimp catch leading the parade. The harvest in 1955 exceeded 100,000,000 pounds.

Considering the commercial and sport aspects, hunting and fishing are valued, monetarily, at $341,443,655, while the aesthetic value can never be figured for those who go afield for recreation only.

From a national viewpoint, hunters spend more money for dog food than is paid in admissions to all the spectator sports combined.

Increase in Revenues

Revenues for the Louisiana Wild Life and Fisheries Commission have increased approximately 40 per cent for the years 1953-54 as compared with 1951-52. Angling license sales have more than doubled—increasing from $238,764.25 in 1951-52 to $497,192.59 in 1953-54, an increase of $258,438.24. Hunting license sales volume for the same period jumped from $566,371.51 to $888,863.65, or an increase of $322,492.14. Freshwater commercial fishing licenses increased from $48,100 in 1951-52 to $111,950 in 1953-54, a gain of $63,850.

These are just three examples of increases which have been brought about by strict enforcement of laws and regulations and stepped-up research and management which have provided more opportunities for sport fishing and hunting and for all commercial endeavors.

Careful and more frequent audits of sand, gravel and shell accounts have resulted in keeping all collections current and in some cases actually brought about collections not heretofore received by the state. Shell royalties have increased tremendously since the severance tax increased from seven and one-half cents to 12 cents per cubic yard, and thousands of dollars in delinquent taxes and fees have been collected. More than $50,000 in delinquent taxes have been collected, some having been due for several years.

Carroll J. Perkins, Ass't. to the Director

Many forward steps have been made in acquiring, improving and maintaining properties and equipment for the Department.

Property Acquired

The Sabine Pass Lighthouse property, near the mouth of Sabine Pass, was acquired from the Federal Government without cost to Louisiana. It is estimated that cost of purchasing the approximately 45 acres of land and improvements thereon would have been about $100,000. A concerted effort was made on the part of Texas to gain this property but Louisiana's request was granted.

We have recently acquired Livingston Lighthouse, Barataria Bay, under the same arrangements, and there is a possibility that a small tract known as Marsh Island Lighthouse may be negotiated successfully.

Some 347,000 acres of land have been leased for public hunting and fishing and game management areas, without cost to the Commission except in rare instances where token or nominal fees were paid. The Commission is cognizant of its responsibility to provide recreational opportunities for as many people as possible.

Statewide Radio Hookup

A statewide radio system has been installed. This is one of the highlighted forward steps of the year 1955, and will serve to further coordinate the many phases of endeavor being carried on by the Commission throughout the state.

Safe and fast speed boats have been purchased for coastal enforcement, waste disposal inspection and research. Similar boats will be assigned to the main stem rivers, bayous and lakes of Louisiana.

The 1955 session of the Louisiana Legislature appropriated $1,000,000 for an administrative building and $200,000 for a laboratory in this building. Development of administrative, research, museum and educational facilities are planned which should make this the outstanding accomplishment of its kind in America.

The Louisiana Wild Life and Fisheries Commission is aware of the many problems confronting those who depend upon our wildlife resources for their livelihoods. Everyday there comes in one way or another to the attention of Commission members and personnel the immediate need for exacting research, remedial masures and forward progressive steps to protect and improve the vast commercial potential which is a natural blessing to Louisiana.

University Contracts

Cooperative fisheries studies contracts have been made with both Tulane University and Louisiana State University. Another contract existing with Louisiana State University covers a comprehensive study of our coastal marshland. This Commission is bearing the cost of this work on the part of these universities because it is felt that information of almost inestimable value will be forthcoming.

The Commission has worked closely with other state departments, with such mutual understanding and cooperation resulting in pyramiding public benefits.

This department has worked very closely with the State Mineral Board, and in recent months has had many opportunities for cooperative state service in view of stepped-up offshore mineral developments. Our department has jurisdiction over seismic agents who enforce state regulations for geophysical permits issued by the Federal government, State Mineral Board and our own agency.

Assistant Director A. A. Sikes

The State Department of Education has responded in a splendid way, affording our person-

Assistant Director W. S. Werlla

nel an opportunity to tell the story of conservation to hundreds of future conservationists.

The Division of Administration has been most cooperative—handling a large percentage of our purchases—and in all cases purchases exceeding $1,000.

The Department of Public Works has planned and supervised many hundreds of thousands of dollars' worth of new projects and improvements to existing facilities for the Louisiana Wild Life and Fisheries Commission. The spirit of zeal and interest, a genuine good job of planning and engineering on every one of these undertakings, merits the thanks and praise of this Commission.

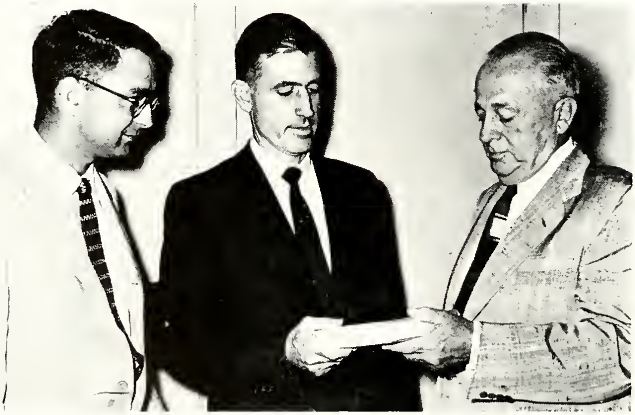
Several cooperative endeavors by this Commission and the State Parks Commission have provided recreational facilities and opportunities for the public.

Boy Scout Program

In 1954 the Commission inaugurated a Boy Scout Conservation program in cooperation with several area councils of Louisiana. Some 500 Boy Scouts were divided into groups that observed every phase of the department's work throughout the state. The tours lasted all of July, and each Scout group was under constant adult leadership. The program was expanded this year, and several changes in procedure encouraged and enlightened the Scouts in good conservation practices. An adult Scout leader accompanied each group along with department personnel, and close attention will be given to each phase of work observed.

Chief Attorney Warren M. Simon

Louisiana's citizenry has generally accepted the Commission's work favorably. Many of the


A. C. Glassell, Commission chairman, receives the first copy of the book, "Louisiana Birds," from Author George Lowery as Donald E. Ellegood, University Press director, looks on.

COMPARISON OF RECEIPTS AND EXPENDITURES—1947-1956

Operating funds for the Wild Life and Fisheries Commission are appropriated by the Legislature from the Conservation Fund, into which are paid revenues from the sale of hunting, fishing and commercial fishing and trapping licenses, oil lease and royalty revenues, sulphur severance taxes and miscellaneous collections. Actually the Wild Life Commission has collected for the Conservation Fund during the period 1947-1956 far more than appropriated for the department's budgetary needs. It is estimated that at the end of the fiscal year, June 30, 1956, there will be a surplus of about two million dollars in this fund. This estimated surplus figure is determined after deducting about two million dollars for operating costs for the year beginning July 1, 1956 and one million dollars for an administrative building, museum, laboratory and aquaria appropriated by the 1955 Legislature. If the latter is not constructed, the Conservation Fund surplus will be three million dollars, to which also must be added any sums which may be deducted from the suggested 1956-1957 budget.

	1946-47
RECEIPTS:	
Licenses, Taxes, Fees, etc.	$ 867,070.74
Mineral Leases and Royalties—Oil, Gas and Sulphur	231,104.62
Total Receipts	**$ 1,098,175.36**
Budget Appropriations	**$ 869,369.28**

	1947-48
RECEIPTS:	
Licenses, Taxes, Fees, etc.	$ 814,092.76
Mineral Leases and Royalties—Oil, Gas and Sulphur	403,158.19
Total Receipts	**$ 1,217,250.95**
Budget Appropriations	**$ 999,050.00**

	1948-49
RECEIPTS:	
Licenses, Taxes, Fees, etc.	$ 644,451.85
Mineral Leases and Royalties—Oil, Gas and Sulphur	394,020.48
Total Receipts	**$ 1,038,472.33**
Budget Appropriations	**$ 952,613.24**

	1949-50
RECEIPTS:	
Licenses, Taxes, Fees, etc.	$ 661,416.87
Mineral Leases and Royalties—Oil, Gas and Sulphur	442,989.39
Total Receipts	**$ 1,104,406.26**
APPROPRIATIONS:	
Budget	$ 957,613.24
Emergency and Board of Liquidation Appropriations	61,500.00
Total Appropriations	**$ 1,019,113.24**

	1950-51
RECEIPTS:	
Licenses, Taxes, Fees, etc.	$ 642,958.92
Mineral Leases and Royalties—Oil, Gas and Sulphur	1,008,773.53
Total Receipts	**$ 1,651,732.45**
Budget Appropriations	**$ 1,365,147.00**

	1951-52
RECEIPTS:	
Licenses, Taxes, Fees, etc.	$ 639,795.64
Mineral Leases and Royalties—Oil, Gas and Sulphur	1,080,447.59
Total Receipts	**$ 1,720,243.23**
Budget Appropriations	**$ 1,263,449.00**

	1952-53
RECEIPTS:	
Licenses, Taxes, Fees, etc.	$ 732,124.63
Mineral Leases and Royalties—Oil, Gas and Sulphur	471,751.51
Total Receipts	**$ 1,203,876.14**
Budget Appropriations	**$ 1,207,083.00**

	1953-54
RECEIPTS:	
Licenses, Taxes, Fees, etc.	$ 846,352.53
Mineral Leases and Royalties—Oil, Gas and Sulphur	706,747.74
Total Receipts	**$ 1,553,100.27**
APPROPRIATIONS:	
Budget	$ 1,152,000.00
Emergency and Board of Liquidation Appropriations	53,200.00
Total Appropriations	**$ 1,205,200.00**

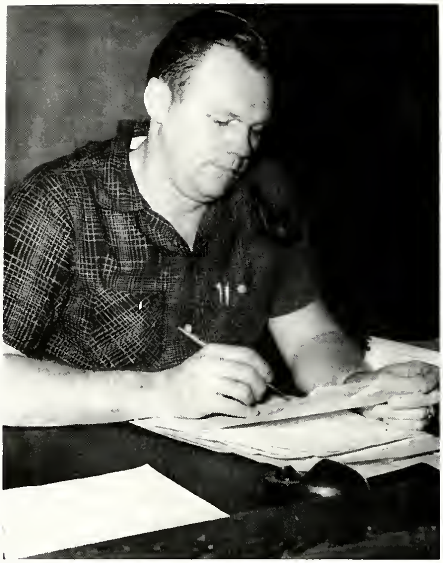
	1954-55
RECEIPTS:	
Licenses, Taxes, Fees, etc.	$ 814,959.98
Mineral Leases and Royalties—Oil, Gas and Sulphur	929,036.61
Total Receipts	**$ 1,743,996.59**
Budget Appropriations	**$ 2,283,213.00**

	Estimated 1955-56
RECEIPTS:	
Licenses, Taxes, Fees, etc.	$ 841,320.00
Mineral Leases and Royalties—Oil, Gas and Sulphur	3,025,600.00
Total Receipts	**$ 3,866,920.00**
Budget Appropriations	**$ 2,087,296.00**

Blue and snow geese feeding in freshly plowed ground.

fish and game management practices are new to Louisiana—but benefits which have come about because of such endeavors as fish samplings, hyacinth control, modestly liberalized fishing regulations, more favorable hunting seasons, more liberalized commercial regulations all have met with general public approval.

The Louisiana Wild Life and Fisheries Commission's program is planned with a view to eventually having this state recognized as the nation's leader in management of its magnificent and bountiful natural resources.



John M. Dunn, Jr., supervisor, personnel section

Part of a portable display available from Education and Publicity to any group in the State.

Division of
Commercial Seafoods

Although Louisiana is endowed in its numerous bayous and marine marshes, bays and sounds, lakes and rivers and sea reaches with the geographical setting for a great fishery, the progress that has been made has been restricted to two species—shrimp and menhaden. Except for these two, the industrial exploitation of our aquatic resources has not developed, and has in some instances declined. Two of importance are worth mention. They are oysters and diamond-back terrapin. The state has a variety of seafoods which is hardly equaled in any state in the country, or in any country, except possibly such latitude spanning areas as Brazil and China. This great assortment includes four of the six ranking money value fish in the United States: Shrimp, oysters, catfish and buffalo.

Louisiana was the largest producer of diamond-back terrapin until the catastrophic appearance of the Eighteenth Amendment which put wine flavored turtle soup out of vogue. A decline from which it failed to recover appreciably even with repeal. The taste for turtle soup failed to be transmitted to the subsequent generation. In addition, Louisiana has an impressive list of money value fish; it has the red and black drums, the sheepsheads, white and speckled trout, pompano, red snapper, whiting, Spanish and king mackerel, bluefish and flounders—all of which are among the choicest seafoods of the country. It may be said that Louisiana has no trash fish, for croakers, spades, spot, mullet, gar and sawfish have excellent edible qualities. And the herring like fishes, together with sharks, have been put to economic uses of importance, particularly the menhaden.

Except the striped bass (Sax), the spoonbill (and in a qualified sense) the yellow cat, no species, so far as we have been apprised, show any sign of biological scarcity or "depletion." The production of most of them, like the terrapin, fluctuates with the general economic picture or varies with the relative popularity of the species.

Robert L. Eddy, Jr., Chief

Wild oysters for instance, may never support an expanding fishery. However, oysters can be increased by cultivation. In quality, the wild oyster taken from natural reefs and crudely prepared for market may be, as often reported, inferior in size, grittiness, grading, etc. *But these things are not fundamental.*

If the efforts of the Commission to restore ecological conditions favorable to oyster production as we hope they will be, there is no reason why Louisiana oysters, with the will and incentive and the ingenuity of the Louisiana oystermen, cannot be produced in quantity and quality equal to oysters from any other source.

That which has been said of the oyster industry may with some degree of speculation also be argued about the shrimp and certain of the fin fishes. The natural habitats of these valuable items of commerce are subject to the constant encroachments of men in ever increasing numbers. We can hardly expect these animals to share the environment without change in number and quality. Mineral exploration has brought about changes in the seafood industry which are beyond the ability of biological observers alone to analyze. Such an analysis would require the efforts and

WILD LIFE & FISHERIES COMMISSION
COMMERCIAL FISHERIES DIVISION
OYSTER DIVISION
Gulf of Mexico
LOUISIANA
LOUISIANA SEA FOODS ARE AS NEAR AS YOUR TELEPHONE
COURTESY SOUTHERN BELL TELEPHONE COMPANY
LOUISIANA SEA FOODS
4000 Louisiana SHRIMP BOATS

Advertising Louisiana's seafood products has been one of the major concerns of the industrial services section of the Division of Commercial Seafoods. Exhibits as shown here, have appeared at all the major hotel and restaurant conventions throughout the United States.

talents of the chemist, engineer, limologist, economist, hydrologist, as well as many others and their combined efforts.

The threatened fisheries, however, can and will survive if left to their devices in the political and economic field. If shrimp, for instance, as is presently the case, can exist in abundance only in certain restricted areas due to the influence of man-made changes and factors independent of the fishery itself, the persons in the industry will seek ways and means to counteract or circumvent the difficulties. This Division, at the petition of the shrimp canning industry, has for sometime investigated the probability of cultivating saltwater shrimp as a means of offsetting the rising costs of production. Mr. Lapeyre, of the Peelers Company, and associates are aware that the increased efforts of the fishermen and rising production costs indicate a decline in stock density, even though the total production has increased, have initiated this activity. Thanks to the work of Malcomb Johnston and Percy Viosca, the cultivation of saltwater shrimp is no longer among the speculative possibilities, but a probability of the near future. So we see that while naturally producing areas of shrimp are being restricted by the activities *of men not engaged in the shrimp fishery*, all is not lost, for cultivation of shrimp will provide us with a supply—the value of which will be directly proportional to the market demand.

A yellowfin tuna, weighing 150 pounds, caught by the Commission boat, "Albacore," is being hauled to the dock by Miles Paturau and crewman T. January. (Fulmer Photo Service).

A typical Louisiana seafood dinner.

In this manner industry survives and solves its problems. We must remember that those who advocate public management of fisheries have been more often wrong than right, and that management practice has in our time reversed itself completely.

Correlated Activities

There is an apparent need for a correlation of field activities within the researches of the Wild Life and Fisheries Commission. The vast amount of data which has accumulated through a third of a century is available for an integrating agency, which in the opinion of this Division should be established.

This is not a new recommendation. The wisdom of past commissioners and directors of divisions have repeatedly pointed to this obvious need. The words of a previous Commissioner, as recorded in the "Ninth Biennial Report of the Department of Conservation of the State of Louisiana 1929," outlined such a Division as follows:

"This Bureau or Division of Biological Surveys, Research and Information is to be, as it were, a controlling office, covering the files of all the Divisions of the Department of Conservation, maintaining at all times complete files properly indexed, alive and active, and offering immediate service to the Commissioner, the Directors of the Department, business concerns, and institutions interested in the natural resources in the State of Louisiana.

"Such a Bureau will be a valuable aid to each Division in answering inquiries, making reports, and keeping the Commissioner and his cabinet properly informed. It is needless to say that such a Bureau will prove a great time saver and will serve a purpose that will enable capital to ascertain the true facts and justify legitimate investment. The records of such a Bureau or Division will be up to date, accurate, scientific and dependable."

Along these lines Dr. H. F. Taylor remarks that there is an apparent lack of relationship between the subjects chosen for biological interest on the one hand, and economic progress and welfare of the fisheries on the other.

Insofar as we may direct biological activities to economic purposes, we respectfully suggest:

That the most important biological study that could be made in our case would be an appraisal of the total biological potential of the fisheries of Louisiana. *"If a study of the Louisiana potential shows that production could be increased 5-, 10-, or 20-fold and the increase is worth so much in dollars, then an expenditure in substantial amounts of money could be justified in order to accomplish the increase.* If, on the other hand, it is found that the *potential increase is only slight, say a factor of 1½ or 2 times, then obviously such large expenditures for development would not be justified.* It would not be possible, of course, to measure the potential accurately, but some general idea or order of magnitude would be indicated."[*]

Adopting Advances

Aside from gear development and exploratory fishing, technological research is not recommended. Freezing, canning, packaging and preserving techniques are not suitable for governmental or university research. This type of research is very expensive in both capital and operation and is best done by industry. The industries of Louisiana can profit better, for the time being, by adopting technological advances already made elsewhere. Prosperity of the Louisiana fisheries will depend on *increased demand for and sales of fish.* Except where cultivation is possible as with the oyster and shrimp, a heavier draft of the natural fishery resources of the state, by more efficient methods from fisherman to retailer, will increase *demand for* and increase *sales of* fish. On this depends the future prosperity of Louisiana fisheries.

Where agriculture is now regarded as a source of wealth to be developed and utilized with the greatest possible efficiency, the fisheries are subject to confusion and contradiction on the part of the public and others. It is desired to expand and increase the economic importance of the self-replenishing fisheries. Before important progress can be made in developing the fisheries, thinking on this subject must be clarified. Emphasis must be shifted in a direction which will give to the fisheries the same kind of encouragement and industrial dignity as has been provided for agriculture. *Unnecessary restraints must be removed.* Assurance should be given *that the use of any improved techniques that may be developed will not be forbidden without scientific justification.*

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[*] Dr. H. F. Taylor, *Marine Fisheries of North Carolina*, pp. 469-472; "Whose facile expression of obvious good sense is my complete guide."—R. L. E.

The exploratory vessel "Albacore" on which gear has been designed which will permit shrimp luggers to be converted to tuna boats at nominal costs.

INDUSTRIAL SERVICES

Chas. A. Murphy

Under the heading "SEA FOOD INDUSTRIES" the Louisiana Revised Statutes 1950, sub-part G, Section 56:571, states:

> "Encouragement
>
> The State shall foster and encourage its sea foods industries which utilize and convert into valuable articles of commerce the shrimp, oysters, and other sea food resources owned by the state in her sovereign capacity, from the utilization of which the state derives large direct revenue in the form of severance taxes."

The intent and purpose of this law was to increase the demand for, and increase the sale of the sea foods of the state. To carry out this legislative directive in one of its phases we initiated a program of Industrial Services with the sole purpose of bringing the Louisiana fishery to the potential markets of the United States.

The first part of the plan was successful. The publishing of the Seafood Dealers Directory filled a need for those who bought seafoods in quantity and who required an available list of suppliers. So successful was this service that a Second Edition was quickly exhausted and a Third Edition is now being printed.

Industrial Exhibits

To dramatize the scope and variety of our sea foods industry it was decided to present an industrial fishery exhibit at trade shows and conventions. This method reaches the largest market in the shortest time and is less expensive over a long period. Space at these shows is at a premium because the number of exhibitors far exceeds the space available. The presentation of the Louisiana exhibit was accomplished by selling the idea to two of the larger associations—the National Restaurant and the American Hotel Associations.

Industrial services section supervisor Charlie Murphy hands Senator Russell B. Long a copy of the seafood dealers directory.

A giant Louisiana shrimp towers over the banquet table at the Mid-South Hotel Association convention in Biloxi, Miss.

The first show, appropriately, was the All-South Restaurant Show at the Jung Hotel, New Orleans, in November 1954. Over 3,000 visitors and delegates saw the exhibit of various seafood products and took copies of the Directory. Officers of the National Restaurant Association observed the exhibit and decided to invite us to the huge annual NRA Show in Chicago the following May.

Washington, D. C., initiated the appearance of the Louisiana exhibit outside of the state. The booth was opened by U. S. Senator Russell B. Long and was visited by over 4,000 delegates to the East-South Restaurant Convention for three days.

In April at Atlanta, Georgia, 5,000 visitors to the Southern States Hotel and Restaurant Show had an opportunity to learn more about the Louisiana seafoods industry. Shrimp and oysters were featured at the exhibit and the hotel industry was sold on our presentation.

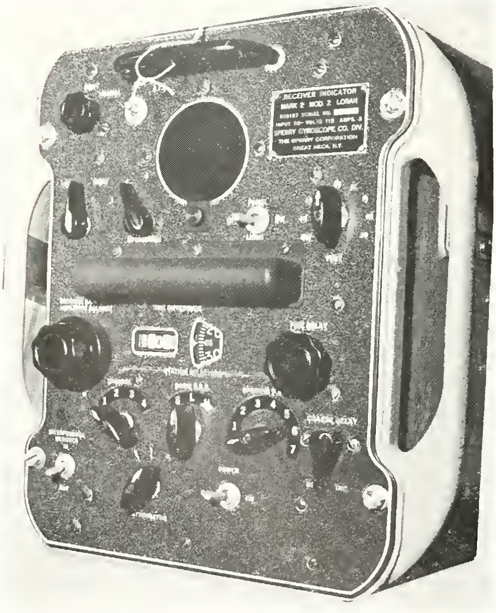
Chicago in May at the National Restaurant Show was our first nationwide presentation. The booth had a model trawler—LOUISIANA SHRIMPER—and 36,000 delegates to the show saw the exhibit. The newspapers publicized the booth and several restaurants featured Louisiana shrimp luncheons during the week. Louisiana shrimp was served at the annual banquet for the delegates at the Palmer House.

The National Restaurant Show in 1956 has again offered us free space for our exhibit. They have also requested that we serve on the program with speakers and a demonstration of Louisiana sea foods cookery. The exhibit was brought to the Texas Southwestern Restaurant Show in Houston, and for the second time to the All-South Restaurant Show in New Orleans.

All channel shortwave radio and directional finder—equipment aboard the "Albacore."

Hotel Conventions

The second large group of buyers of seafood products is the hotel industry. As a result of the publicity given our Seafood Directory by the State Hotel Associations all over the country, we were invited to attend several hotel conventions as delegates. The first meeting of the Mid-South Hotel Association was held in Biloxi in September 1955. Louisiana shrimp and oysters were served at the banquet to over 400 hotel operators and warm acknowledgment was made by the toastmaster during the proceedings. As a result we were invited to attend the American Hotel Association Convention in Los Angeles. Over 1,200 hotel operators and owners were in attendance. At the opening reception at the Beverly Hilton Hotel, Louisiana shrimp was served under the direction of Conrad Hilton to 1,500 guests. The presentation of the Louisiana shrimp at this affair pointed up the importance of Louisiana fisheries. No other organization, state or private, had been invited to participate in this function.



Loran, long-range navigation instrument, aboard the "Albacore."

During the year 1956, the American Hotel Association National Convention will be held in New Orleans and a staff member will be on the arrangements committee.

Industrial Public Relations

Other organizations who have cooperated in our program include the National Fisheries Institute, Southwestern Frozen Food Association, and the American Dieticians Association.

A select convention is the National Food Editors of the United States and Canada, and we were invited to their convention as an observer. These food editors from newspapers all over the United States and Canada write chain and syndicate newspaper articles on food and are usually the editors of the woman's page. Their reception of Louisiana seafood story should result in wide publicity for the state fisheries in the future.

Weather Ship Program

The Division was responsible for the inauguration of a program to establish a floating weather station in the Gulf of Mexico during 1954. At a large scale press conference, which included members of the Chamber of Commerce, Gulf States Marine Fisheries Commission, Telephone Company, several off-shore oil operators, and the fisheries industry, the matter was explained by Louisiana's well-known meteorologist, Nash C. Roberts, Jr., of New Orleans. As a result of this conference a brief was prepared and presented to Honorable T. Ashton Thompson, member of Congress from the seventh Louisiana district and a member of the House Committee for Merchant Marine and Fisheries. As a result of this action Mr. Thompson introduced the first Gulf of Mexico floating weather station bill and the bill was immediately referred to his committee. Congress adjourned in August of 1954 and the bill died in committee.

We continued to correspond with the original members of the weather ship committee and kept their interest alive in the program. In January 1955 immediately following the convening of the 87th Congress, Mr. Thompson introduced HR-198 asking for a weather station in the Gulf of Mexico. Companion bills were introduced by Congressman Frank Boykin of Alabama, Congressman William Colmer of Mississippi and Congressman Joe Kilgore of Texas.

In the Senate, Mr. Stennis of Mississippi introduced a bill and Senators Ellender and Long introduced a joint bill for the same purpose.

The matter was given wide publicity all over the Gulf States and many editorials appeared in newspapers in the five Gulf States and in several mid-western newspapers.

The Chamber of Commerce of the New Orleans area prepared a brief which was submitted to Congress and copies of the brief were mailed to over forty Chambers of Commerce in the five Gulf States.

Resolutions were unanimously passed by the Gulf States Marine Fisheries Commission, The National Canners Association and the National Fisheries Institute.

A joint resolution of the Louisiana Legislature had been passed and signed by the governor of Louisiana and a similar resolution passed the legislature of Alabama.

As a result of this action the appropriations bill for the Department of Commerce was amended to include $96,000 for the Weather Bureau for a floating weather station in the Gulf of Mexico. This amendment was included at the suggestion of Senator Ellender of Louisiana and accepted by the House Conference Committee on the motion of Congressmen Boggs and Thompson.

The weathership did not materialize on September 1, the deadline set by the Weather Bureau. The matter is now pending bfore the House Committee of Mrchant Marine and Fisheries and the Senate Committee on Interior and Insular Affairs. At the latest indication some action will be taken by the Congress to bring about the protection to our fishermen and other gulf industries, which can only be obtained through the use of a floating weather station.

The cost of lives and money due to the sudden storms coming from the uncharted area of the Southwestern Gulf is a situation which should have been corrected many years ago. It becomes absolutely imperative now that oil operations are extending further into the Gulf and the increasing number of fishermen presently risking their lives daily in this dangerous area of formative weather.

Ecological Research Section

Percy Viosca, Jr., Research Biologist

Ecology may be defined as that branch of biology which deals with the environments of liv-organisms. The fishery ecologist must have a working knowledge of water physics and chemistry, geochemistry, biochemistry, physiology, taxonomy, microbiology and parasitology. He must be familiar with such ecological phenomena as food chains, competition, predation and population dynamics. He must gather pertinent data

Biologist Viosca

pertaining to climate, stream flow, and (or) tides. And, above all, he must be able to correlate this information if he is to achieve an understanding of any single species on the face of this earth.

Furthermore, the practical fisheries ecologist must not only be able to evaluate and integrate these diverse types of physical, chemical and biological knowledge, but he must be able to apply his findings for the benefit of the fisheries. The results of ecological research may bear fruit in a number of ways: in recommendations for new legislation, or the repeal of ill-defined or harmful legislation, which is always confusing, hampers industry, and is costly to enforce; in the development of more efficient methods of harvesting natural yields; in the utilization of these yields at levels of maximum values; in the development of engineering structures and of methods of culture of aquatic crops under partial or complete artificial control.

Keeping the above in mind, your biologist has devoted a major part of his time to the study of important commercial salt and brackish water species. Primary emphasis has been placed on the ecology, growth rates and migrations of the commercial shrimps so that recommendations can be made which might lead to more economic production and greater yields.

No attempt has been made to duplicate the work of other agencies, but rather to assemble, evaluate and integrate pertinent information derived from federal, state, institutional and private sources. Ecological research units, sponsored by this division, were established at Tulane and Louisiana State Universities. The activities of the former were mainly in waters east of the Mississippi River, the latter largely west of that stream. The Scripps Institution of Oceanography, operating geographically between these two fields of activity, in the Mississippi Delta and contiguous waters, is concurrently undertaking some valuable ecological research under grant from the American Petroleum Institute. Their results are being integrated into our program wherever pertinent.

Collaborating Agencies

Other collaborating agencies are the U. S. Engineers, Coast and Geodetic Survey, Coast Guard, and Weather Bureau; the Sewerage and Water Board of New Orleans, the Louisiana State Board of Health, the Freeport Sulphur Company, and other firms and individuals. In his capacity as Louisiana's representative on the technological committee of the Gulf States Marine Fisheries Commission, your biologist has taken advantage of many opportunities to confer with other biologists and technical men doing similar work and who cover, in the aggregate, the entire Gulf of Mexico.

Recommendations to Shrimp Fishery

Progress in shrimp studies has reached a stage where recommendations can be made which deserve serious thought by the entire industry as they may well lead to more economic production and higher yields with far less fishing effort.

Size of Mesh. Experimental trawling with small mesh bags tied behind or dragged beside regular commercial trawls has shown that the larger the mesh, the less the slaughter of shrimp of non-commercial sizes. It is recommended, therefore, that the minimum size of the trawl mesh be increased from the present legal size of ¾ inch bar (1½ inches stretched) to a mesh of ⅞ inch bar (1¾ inches stretched).

Closed and Open Seasons. It is also recommended that commercial shrimping in inside waters (except in limited quantities for bait) be prohibited during the months of December, January, February, March, April, July and August, and permitted during May, June, September, October and November. These extensions to the present closed seasons should prevent the vast destruction of young shrimp of pre-commercial sizes which occurs now at the beginning of each of the present open seasons.

Shrimp grow at phenomenal rates. They appear to double their weight every 12 to 15 days, depending upon size, locality, season and food supply. There is a potential three to fourfold increase between August 8 and September 1. The September fisherman, then, should harvest a yield some three to four times the weight and six to eight times the value for the same fishing effort as compared to the August fisherman, provided he does not destroy the bulk of the season's brood by fishing too early with too small a mesh. It would seem to be good economics as well as good conservation to keep the inside seasons closed until the first of May and the first of September respectively.

Opening of the entire month of June to commercial shrimping in inside waters will permit a harvest of the large brown shrimp (brownies) which are returning to sea at that time. The small white, so called "season" shrimp, will not as yet have entered the commercial fishery, and there is little danger of their slaughter until after the first of July, especially with an increased mesh size as recommneded above.

No closed seasons are recommended for outside waters because some 50 per cent of the year and some 50 per cent of the shrimp habitat are already closed by adverse weather, bad bottom and other factors.

Night and Surface Trawling. Shrimp disappear "mysteriously" at various times. It is known that both white and brown shrimp leave the bottom when they return to the sea from inside waters. As predation in the sea must be terrific, it may be best to harvest these large migrating shrimp whenever and wherever they are available to mankind. It certainly warrants a try. As shrimp appear at the surface infrequently during daylight hours, night fishing should be permitted if we in Louisiana wish to harvest the cream of the crop before much of the eastern segment of the shrimp population moves into Mississippi waters, and the western segment into waters off the Texas coast.

Whenever a shrimp concentration is located, on surface or bottom as the case may be, there is no logical reason to prohibit fishing just because the sun has set. Shrimp usually disappear or scatter with a change of the tide or the weather, so why not let the fishermen work when working conditions are favorable, regardless of the positions of the sun and the moon with respect to the earth. Expensive ice continues to melt away, and shrimp already aboard slowly deteriorate in quality whether the fishermen are working or idle. Why not let them take advantage of the favorable periods, which are all too short at best, so they can go home for much needed rest during unfavorable periods? The harvests of both pink and brown shrimp can be increased substantially by night fishing.

Use of Set Nets. Trawls set near the surface with the bag projecting seaward are very profitable in Atlantic estuaries, especially in the North Carolina region. There, the large brownies migrate seaward near the surface at night with falling tides. They cannot be profitably taken during the daylight hours, so one might think they were scarce and in need of protection. The only difference between the North Carolina method and ours is that there the water moves through the trawl and here the trawl moves through the water. Shrimpers should be free to use different sets on both top and bottom in order to develop new techniques which may be more applicable to conditions in our local waters.

New Types of Trawls. A recent innovation in the Florida pink shrimp industry is the use of a roller to which the lead line of the net is attached at either end. No "doors" (trawl boards) are necessary. During daylight hours, pink shrimp hide amongst vegetation and animal growths (sponges, corals, hydroids and bryozoons). As the roller rolls over this material, the shrimp skip upwards and are caught in the trawl which follows. A guard of mesh extending above and in front of the roller and on either side prevents the shrimp from skipping over the top and sides of the net. The catch of these nets is unusually clean.

As both brown and white shrimp are known to bury in the bottom, it is conceivable that the use of a roller might bring up greater yields from certain types of bottom from which they are not now available to the fishery. Incentive to invent new types of nets and gear must not be discouraged.

Chumming of Shrimp. Attracting fish by chumming is practiced throughout the world, and there is no record of reduced yields as a result of the practice. On the contrary, many species cannot be concentrated economically by other methods so the actual yields are substantially increased thereby. When their food supply is scattered, shrimp are also scattered and thus unavailable to the fishery. Chumming will bring them together and make them available. In fact the schooling of shrimp is often the result of natural chumming, the concentration of food in eddies, depressions, deltas and the like, so the fishermen are actually taking the advantage of the natural chum. Why not let them imitate nature?

A number of species of fish and other marine organisms, called "trash fish," are thrown overboard during trawling operations. These serve as food for gars, sharks, porpoises and other species which are in direct competition with the human race for the products of the sea. The practice thus favors our competitors for nitrogenous foodstuffs. Grinding machinery, similar to garbage disposal units, would cut this trash fish into small fragments, making it available to shrimps, crabs and the smaller creatures which serve as their natural food supplies. Thus we could return this waste to the bottom of the food chain instead of feeding it at the very top to undesirable competitors of the human species.

It might well be that the practice of grinding up this waste material and throwing it overboard, besides the chumming effect, will make available a substantial supply of food for the smaller shrimp which escape through the meshes of trawls. As it takes some three to five pounds of food to grow a pound of shrimp, this high quality, 50% protein food could well become a boon to the shrimp fishery should the practice become general. For each pound of shrimp removed from the water, there might be enough waste thrown overboard to produce an additional pound or more.

Engineering Structures. Flood Control in the Mississippi Valley has shunted the flow of that stream system directly into the Gulf of Mexico rather than through the deltaic estuaries as was the case under primitive conditions. Dr. Gordon Gunter has shown that the white shrimp harvest along the Texas coast is directly proportional to the amount of rainfall in the Gulf drainage area of that State. As is the case with Texas streams, the Mississippi River water is rich in phosphates and other nutrients which are in short supply in the sea and brackish waters.

Lack of phosphates is undoubtedly a factor which limits shrimp productivity. A series of siphons placed at the now sealed-off distributary sources would not serve the purpose of replenishing these phosphates, because they would flow only during times of high water when the nutrients are in least demand. Controlled flumes, on the other hand, could make our Mississippi distributary system the greatest irrigation system in the world. The flumes could be operated throughout the summer when needed most for supplying fresh water, with its abundant nutrients, to our valuable esturian life (shrimps, crabs, oysters and some of our most desirable food and game fishes). The flumes could be closed during high water stages when heavy loads of silt would otherwise be a problem to contend with.

Shrimp Farming. Your biologist, as a child, learned to keep white shrimp in captivity without loss. Live bait dealers in Louisiana and elsewhere have found that shrimp continue to feed, shed and grow rapidly, even in close confinement. The pink shrimp of west Florida, from Key West to Tampa Bay, is kept in confinement, not only in live boxes, but in ponds of varying size. Robert Lunz at Wadmalaw Island near Charleston, S. C., and Malcom Johnson and James Fielding at Marineland, Fla., are pointing the way to shrimp cultivation in their respective states. Thus, shrimp farming in salt water ponds is on the verge of coming into being. A boost from the powers that be and a few experiments, should serve to create a promising new industry which could provide shrimp at such times as the natural supplies are short and prices highest.

In addition to shrimp farming in completely controlled impoundments, there is another promising possibility, that of rearing shrimp under natural conditions in partially controlled tidal lagoons and ponds. This is a practice used successfully for certain fish species throughout the Orient. White shrimp which enter lagoons with the tides in June at an average size of about two inches, grow to a size of six to seven inches by the latter part of September. With the advent of cool weather, usually after the autumnal equinox, these large shrimp return to the sea, sometimes through a single small outlet. This migration may last only a few days or may be prolonged, depending on the weather.

Trawl bags set in outlets to such lagoons have yielded immense returns, but the fishermen involved are very secretive because they fear they may be inadvertently violating some law, or in any case, do not like to reveal the locations of their "gold mines." Controlled outlets placed at such vantage points show great promise of yielding immense returns to the owners or lessors of such lagoons. A precedent for leasing has already been set by the oyster industry. An experimental site of such nature would point the way to the management of such partially controlled natural lagoons.

As the above recommendations have been arrived at after mature thought and years of study of marine resources, they deserve careful consideration by the Shrimp Industry.

Division of
Education and Publicity

John Blanchard, Chief

It has been said that no program can go faster than the accompanying education and information setup and it was with this in mind that every effort was made to make the people of Louisiana cognizant of the Commission's aims to protect and propagate the myriad species of fish and game in this diversified state.

Because of the broad, long-range programs of the Commission, new staff members, new equipment, new ideas and plans for the future have been realized. To cite some of the highlights, a youth education program on a statewide basis is now in progress, a weekly statewide radio program is in operation on the major stations in Louisiana, a weekly television show is conducted from a New Orleans station, the magazine, *Louisiana* CONSERVATIONIST, has been improved in content and its circulation increased, two new movies have been produced by the division staff with 10 others scheduled, the film loan library has been increased by 30 movies, a still library has been established with more than 4,000 negatives and photographs filed and recorded, the staff has been increased by five, new and modern equipment has been purchased, and a more intense effort, public relations-wise, had been made.

To this division is delegated many routine and special activities which concern the promotion of Louisiana's natural resources insofar as wildlife and fish are concerned. In order to do this we must have a working knowledge of the activities and aims of each division within the Commission. The Division of Education and Publicity, above all, is a clearing house for all types of information sought by the peoples of this state and out-of-state residents, bureaus and institutions. By answering the many queries which come to this office, we are able to acquaint non-residents and natives alike with the abundantly rich natural resources in Louisiana.

Favorable Sentiment

The favorable public sentiment toward the aims of the Commission is a "mirror of progress" which is evident to everyone interested in outdoor activities, sports and commercial. This can be attributed, to a large extent, to the public relations contacts made by this division, with luncheon clubs, sportsmen's organizations, civic and service

Photographer Jack Britt, added to the division staff in 1954.

clubs, school groups, church groups, Boy Scouts, 4-H members, garden clubs and other organizations.

The *Louisiana* CONSERVATIONIST, a welcome piece of educational and informative literature in 43,000 homes, is compiled, edited and published by this division. Since the resignation of the editor, September 1, 1955, the division chief has handled the publication. The magazine is well-illustrated with photographs, maps, drawing and even cartoons.

Since the CONSERVATIONIST is sent free-of-charge to subscribers, every effort is made to make it as desirable or more so than the paid publications costing 25 cents or more. Reprints from other publications, unless they apply specifically to problems or situations in Louisiana, are not carried. Color was used on the cover for the first time in July 1955.

The CONSERVATIONIST received two national awards in the past two years for excellence in content and makeup. More than a quarter of a million people see the magazine each month.

Museum, One of Highlights

Louisiana is one of two states in the nation to own and operate its own wildlife museum—and without an admission fee. The Wild Life and Fisheries Commission Museum, located at 751 Chartres St., New Orleans, displays more than 3,000 native Louisiana specimens. It is a showplace which attracts 250,000 persons annually.

From this museum go portable exhibits to every major fair and festival in Louisiana and to many district and regional affairs. To attest to the popularity of this activity, requests are made for the displays as much as a year in advance. Permanent displays may be seen at the State Fair in Shreveport and at the New Orleans Airport.

The auditorium in the museum, which has a seating capacity of 200, is available to all groups for special showings. Schools, Scouts, garden clubs and others use this facility the year round.

An average of 85 movies per month are distributed by the film loan library which is maintained at the museum. Attendance at the movies exceeds 6,000 monthly, and this does not include the thousands which see the films on television. There are presently 97 movies available to the public.

Museum Curator J. Edouard Morgan puts the finishing touches on an American Bald Eagle.

New Films Produced

Another "first" is the production of our own movies. Two new films, "Wildlife in Review" and "Harvesting Louisiana's Furs," are being widely distributed at present. Three others, including shrimp, oysters and enforcement, are in production at this writing.

This Biennial Report, a "bible" for wildlife and fisheries, is compiled and edited by this division and is sent to members of the legislature, each school in Louisiana, wildlife groups, other state wildlife commissions and to anyone interested in any phase of wildlife in Louisiana.

A full-time photographer for both stills and movies was added to the staff in 1954. Since this time a darkroom has been set up, thereby representing a saving of considerable monies in the operation of Education and Publicity.

A library of stills, containing more than 4,000 negatives, contacts and 8x10 prints, has been indexed in the past two years for another "first" by the division. These photographs are used in illustrating the CONSERVATIONIST, special photos for newspaper and magazine publication. Photos from this library have appeared in such publications as OUTDOOR LIFE, SPORTS AFIELD, FIELD AND STREAM, FISHERMAN, SOUTHERN FISHERMAN, SPORTSMAN, TRUE and others.

Help in Publicizing

Encouragement has been given national publications in publicizing outdoor opportunities in Louisiana. During the past two years the following magazines have carried such stories: SATURDAY EVENING POST, LOOK, LIFE, FIELD AND STREAM, OUTDOOR LIFE, SPORTLIFE, SPORTSMAN, MEN, FISHING AND HUNTING, PARADE, SPORTS ILLUSTRATED, COLLIER'S, TRUE, FISHERMAN, SPORTS AFIELD, EBONY and others.

Youth Education staff member Chas. D. Phillips, Jr.

Approximately 500 Boy Scouts are informed and entertained each summer, taken on wildlife tours of the state and kept for a week at no expense to the Scouts. This is a part of the youth education program in which each division participates.

The first teacher workshop at Grand Isle conducted by L. S. U. in cooperation with the Commission.

April 5, 1955 marked the beginning of the first state-wide radio program from the Louisiana Wild Life and Fisheries Commission. Prepared by this division is a 15-minute program now being aired over 18 major stations in the state. The listening audience has been conservatively estimated at 250,000 weekly.

In operation for the past two years has been a regular weekly television program over a New Orleans station. Consideration is now being given to a statewide TV program over stations in Baton Rouge, Alexandria, Monroe, Shreveport and Lake Charles.

Speakers Available

Speakers from this division address wildlife, civic, service, veterans, youth clubs, along with garden clubs, church organizations and others making the request. In addition, movies and slides are used in illustrating the talks, when necessary. These are public relations activities, but the "conservation story" will be told on a moment's notice to any group, within and without the state.

In addition, writers of this division prepare special speeches and material for delivery by other Commission personnel.

Indoctrination and training courses for all personnel are set up by this division, such as programs for Ranger Schools and new personnel coming into Commission employ. This is an idea originating in the past two years.

Exclusive of the CONSERVATIONIST, approximately 60,000 pieces of literature are distributed by this division upon request each year. This does not include safety hunting posters, 10 commandments of hunting, nor publishing fishing and hunting regulations. This figure does, however, include such booklets and pamphlets as "Common Birds of Louisiana," "Hunter's Guide to Wild Waterfowl," "Poisonous Snakes, Plants and Black

Mel Washburn, radio and television program producer, for the Division of Education and Publicity. A statewide radio program was instituted in April 1955 while the TV series has gone uninterrupted for almost three years.

High school seniors are taken on an educational tour in two of the Commission's quarter boats as a part of the youth education program.

Widow Spiders," "Hawks," "Eleven Pennies for Better Hunting," reprints from the CONSERVATIONIST, brochures, etc.

Remarkable Record

Approximately 12 news releases per month, not including special photographs and stories of special events, are issued to the state's 130 newspapers, 30 radio stations and TV stations. The publication record has been remarkable, as confirmed by the clipping service.

During the past two years, we have played hosts to the Southeastern Game and Fish Commissioners Conference and the American Association for Conservation Information and have participated in other worthwhile group meetings such as the Louisiana Press Association, National Fisheries Society, North American Wildlife Conference and others.

Deciding that not only the public should be informed, but also Commission employees, an inter-department Newsletter has been printed monthly for the past year. Policies and procedures of the Commission, births, deaths, marriages and other items of interest are carried in the mimeographed publication.

Equipment and staff increase in the past two and one-half years:

Museum receptionist and film loan librarian, two youth education representatives, radio and television producer (public relations associate), photographer and one secretary.

Equipment: Two slide projectors, five cameras, five automobiles, three movie projectors, three typewriters, one filmstrip machine, complete photographic darkroom equipment and miscellaneous office and photographic supplies.

The importance of our natural resources cannot be overemphasized; the recreational and aesthetic values cannot be measured; but their places in the lives of the people of Louisiana are now being brought to the forefront for the first time with this "new era of conservation" in the Pelican State.

Education Activities: The instruction of the youth of Louisiana in the proper management and conservation of this state's abundant fish and wildlife resources has been an objective of the Louisiana Wild Life and Fisheries Commission from its early inception. No informed conservationist will doubt that any permanent progress in resource development is dependent on the attitudes and the activities of future, as well as present citizens. A youth education program must instruct these future citizens and leaders in their responsibilities as well as their privileges in the proper care and utilization of our fish and wildlife and the elements that control them. If we in Louisiana are to continue in the progressive administration and conservation of our game and fish,

Fish and Game Photo

One group of the more than 500 Boy Scouts entertained as a part of the Commission's summer youth program.

Youth Education staffer Arthur L. Rozas.

greater emphasis must be placed upon this phase of the Commission activities.

In those states recognized as the most advanced and successful in wildlife conservation, recent biological data and information is constantly channeled to adults and youth through a statewide educational and informational program. The earliest youth education activities began the second week of January 1953 when a program emphasizing the importance of wildlife food and cover was presented to 4-H clubs in more than 10 parishes. This program was carried on until the end of the school year of 1953.

During the spring of this same year a study was made of the Junior Conservation Club program of Kentucky. The Kentucky Fish and Wildlife Resources Department has a youth education program that extends to every school in the state. From this study members of the Education and Publicity Division launched a new phase of educational work. Beginning the first week of July, Wildlife Conservation Clubs were organized in the Florida Parishes. By the early part of October more than 44 clubs were organized. Each of these clubs met monthly. At the monthly meeting a 50-minute program on such topics as Louisiana birds, snakes, fish, fur bearers, wildlife management, soil, forest, water and wildlife conservation was presented.

These 44 clubs were to be the beginning of a statewide junior club program.

In January 1954 Arthur Rozas was added to the division to assist in expanding this endeavor. Even though it was the middle of the school year, Rozas succeeded in organizing an additional 30 clubs.

To achieve a statewide program, it was necessary to revise plans to enable a staff of two to carry on such a task. After a staff meeting, it was decided to confine the activities of our youth program to the eighth grade class. The eighth grade was selected because in that grade all students are required to study a "Louisiana Natural Resource" textbook. This is a statewide requirement. Since it would be an impossibility for two representatives to personally appear in the eighth grade of each of the public schools containing such, another approach to the type of aid to offer was necessary. After much thought it was decided to supplement the two chapters from text—"Our Wildlife" and "Our Fish and Other Sea Food." After carefully selecting printed material which would supplement these chapters and preparing suggestion sheets as to how they would be of assistance to the teacher, a kit composed of 14 pieces of printed material was assembled.

Following the assemblage of enough material to supply every eighth grade instructor in the state with a wildlife kit, the two representatives began in the Fall of 1954 to make personal contact with all public eighth grade teachers (Louisiana Natural Resources teachers). The purpose of making this contact was not only to provide the assembled supplementary material, but to also compile a mailing roster for the Commission's magazine, *Louisiana* CONSERVATIONIST. It was the desire of the division that every teacher instructing in this field should receive a personal copy of the magazine. At the present time each teacher should be constantly receiving supplementary material through the pages of the *Louisiana* CONSERVATIONIST. Literature, numbering 13,890 pieces, was distributed.

Make Personal Visits

After the completion of this statewide contact, both youth representatives began to make personal visits to schools to present a 55-minute program to eighth graders and other students whenever it was possible to include them. For the remainder of the 1955 school year the film "Heritage We Guard," along with a 25-minute lecture was presented. This film shows the thoughtless exploitation of our abundant soil and wildlife resources by early American settlers. Such consequences of this exploitation as erosion, dust storms, stream pollution and depleted wildlife population are portrayed. Along with some excellent photographs of wild birds and animals, the important economic and recreational value of our wildlife to this nation is shown. By illustrating that soil conservation practices such as reforestation, contouring, terracing, gully control, etc., not only protect topsoil and assure clean waters, but also furnish food and home for wildlife, the close interrelation of soil and wildlife is revealed.

Most of Southern Louisiana was covered with this program in the spring of 1955.

At the beginning of the 1955 fall school term additional copies of this film were obtained and distribution plans for the remaining part of the state were arranged. Through the cooperation of the Enforcement Division, rangers in these parishes have ably assisted in the distribution of the "Heritage We Guard" film. After securing the permission of parish superintendent, rangers contacted school principals and made available the film and some wildlife material for eighth graders. Where suitable facilities are available usually science and other interested classes view the film, too.

While the rangers were distributing the film the two youth representatives were visiting more schools and presenting another wildlife program. Those parishes in and around the heavy industrialized southern part of the state were covered with a 45-minute program on water pollution. This program consisted of a 25-minute color movie, "Clean Water," followed by a 20-minute commentary on the Louisiana situation—present and future.

While the main concentration of the work has been on the youth of this state, both youth representatives present programs to adult groups. In the past few years wildlife programs have been given to such diversified groups as Father's Club, Flying Sheriffs, Men Organizations of Churches, Lion's Club, Kiwanis and Rotary Clubs, P-TA's, college students, school teachers, industrial school youth, church camps, 4-H camps, Boy Scout camps and troops, Girl Scout camps, sportsmen's clubs, Gun Clubs, Garden Clubs, Veterinarian groups, junior deputies, etc. During the past three years the youth education staff has made the following contacts and with attendance as listed:

1953......271 programs......15,652 total attendance
1954......250 programs......27,009 total attendance
1955......215 programs......19,870 total attendance

It is still the aim of the Education and Publicity Division to secure additional personnel. With our Enforcement Division and Fish and Game Division already established on a district basis, it is the intent of the Education and Publicity Division to have an educational representative in each of these nine districts. With a man available in each district, definite and permanent program schedules could be set up for each particular area. It would then be possible to have regularly scheduled wildlife programs at all schools, summer camps, civic clubs, sportsmen clubs, and other organizations throughout the state. By closely working with other divisions in the district, the educational representatives could channel to radio, newspaper, and TV the information that would be of interest to the citizens of that area.

Claude H. Gresham, Jr., Editor of the CONSERVATIONIST, until his resignation in September 1955.

Division of

Enforcement

This report of the Enforcement Division covers the entire years of 1954 and 1955 which are the second and third years of operation of the constitutionally established Louisiana Wild Life and Fisheries Commission. This is only a brief report in which only the major changes and improvements of the last two years are noted and no attempt is made to outline or cover the workings of the Enforcement Division.

The primary function of this Division is to enforce all fish and game laws and to provide protection for all of Louisiana's wildlife resources. In order to best do this the state is divided into nine districts of about equal areas. A supervising officer, designated as a Ranger Captain, is placed in charge of each District and is responsible for enforcing the game laws in his district. Working under the supervision of each Captain are Game Rangers who are usually assigned to work in a particular parish. There are 125 Game Rangers employed by this Division at this time or an average of about two rangers to each parish. Each district will in the near future have a complete office located in the headquarter city for the district. (Included in this report is a map showing the district set-up.)

Every ranger in the state has now been furnished at least one boat, motor and trailer for use in his official work. Complete summer and winter uniforms are now furnished all rangers and supervising officers. The minimum salary of a ranger has been raised through Civil Service to $280 per month, which assures the state of getting and holding a high type of worker as ranger. The requirements for employment as ranger remain high and the Division has been very successful in obtaining excellent men to fill vacancies through Civil Service. With the increase in commercial activities and the increased pressure of sport hunting and fishing it will be necessary to increase the number of rangers in the future in order to properly protect our wild life resources.

John L. McGee, Chief

The Division has greatly expanded its fleet of fast twin-motored boats in order to adequately regulate the commercial fishing and shrimping industry on the coast of Louisiana. The new boats have proven a great success in enforcement work. Constant patrols by the new boats along with the two large boats and planes have been extremely

Major Ben C. Dahlen who is in charge of inland enforcement activities.

effective in keeping down violations of commercial fishing laws and certainly benefited the industry.

The operation of the wharf, maintained at West End Boulevard, New Orleans, where all motor and boat repair and maintenance work is done is covered below.

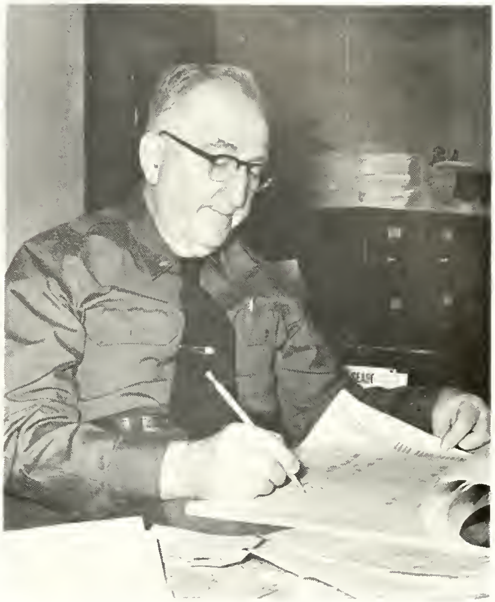
The operations of the Airport facilities at New Orleans are also covered in the report below.

The lack of two-way radio equipment which has kept this division from being a first rate enforcement agency has been eliminated. We now have complete statewide coverage with at least one mobile unit in each parish of the state. When the set-up outlined below is completed, Louisiana will have one of the finest game enforcement divisions in the country.

The program of strict, fair and impartial enforcement of our game laws has continued through the last two years and with the help of the elected officials received wide support. Several educational programs and schools for the rangers have been conducted in order to make them better public servants.

The activities of the rangers have been expanded from solely enforcing the law until now he is expected to do public relations work, educational work in schools, and activities of fish, game and seafood management nature. During one month each year the rangers devote much time to the Scout program of assigning Scouts to learn conservation at first hand from the rangers.

Results of the enforcement program can best be determined by examination of the following record for the years 1954 and 1955.



Capt. Anthony Berni who keeps enforcement records in the New Orleans office.

Major Marion Solito with decals on Wild Life and Fisheries automobiles and boats.

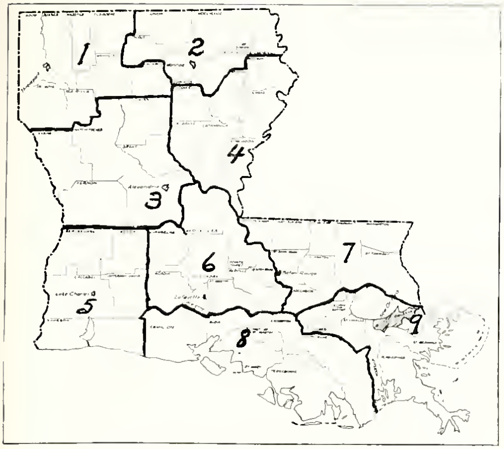
LOUISIANA GAME AND FISH LAW VIOLATIONS

	Type of Violation	1954	1955
1.	Angling without license	790	1049
2.	Commercial Fishing without license	147	149
3.	Selling Fish without license	56	58
4.	Electrocution of fish	62	43
5.	Trawling without license	32	37
6.	Trawling with over 50′ trawls	0	6
7.	Trawling at night	2	9
8.	Trawling in closed waters	60	104
9.	Seining in closed waters	0	10
10.	Possession of undersized fish	122	15
11.	Possession of over limit game fish	31	9
12.	Possession of game fish for sale	7	0
13.	Possession undersized shrimp	50	22
14.	Possession undersized crabs	10	3
15.	Possession undersized frogs	0	0
16.	Taking alligators in closed season	4	2
17.	Possession over limits Mig. water fowl	53	71
18.	Possession illegal deer meat	8	12
19.	Hunting Mig. water fowl illegal hours	88	96
20.	Hunting and killing over limit wood ducks	0	10
21.	Hunting and killing wood ducks	34	0
22.	Hunting Mig. water fowl closed season	45	52
23.	Possession of water fowl out of season	7	0
24.	Hunting Mig. water fowl without duck stamp	39	26
25.	Hunting Mig. water fowl in baited pond	16	16
26.	Hunting on State Preserve	28	73
27.	Hunting without license	175	173
28.	Hunting at night	390	297
29.	Hunting with unplugged gun	177	132
30.	Hunting quail in closed season	32	10
31.	Hunting squirrels in closed season	143	125
32.	Hunting dove illegal hours	14	20
33.	Hunting and killing dove from auto	0	2
34.	Possession over limit of squirrels	3	2
35.	Possession over limit of doves	15	22
36.	Running dogs in closed season	0	7
37.	Hunting dove in closed season	37	56
38.	Killing doe deer	45	23
39.	Killing song birds	0	1
40.	Killing deer in closed parish	6	10
41.	Killing deer in closed season	55	25
42.	Hunting deer on public roads	6	5
43.	Hunting and killing White Ibis	0	2
44.	Hunting frogs in closed season	30	28
45.	Hunting frogs in illegal methods	5	33
46.	Hunting rabbits in closed season	32	44
47.	Hunting turkeys in closed season	4	16
48.	Killing hen turkey	0	4
49.	Hunting snipe in closed season	4	5
50.	Hunting and killing grosbec	5	5
51.	Hunting and killing egrets	1	0
52.	Hunting and killing crane	1	7
53.	Fishing game fish illegal tackle	105	51
54.	Fishing commercial fish illegal tackle	72	63
55.	Fishing without non-resident license	144	234
56.	Fishing with explosives	5	2
57.	Commercial fishing in closed waters	0	2
58.	Fishing on State Preserve	6	2
59.	Hunting fur bearing animals with gun	21	27
60.	Hunting from power boat	46	49
61.	Hunting and killing robins	15	5
62.	Hunting woodcock in closed season	2	0
63.	Hunting woodcock illegal hours	0	1
64.	Hunting frogs with gun	0	0
65.	Trapping without license	12	13
66.	Trapping out of season	14	9
67.	Trapping on State Preserves	9	1
68.	Trapping on rat bed	0	0
69.	Camping on Refuge without permit	15	6
70.	Buying fur without license	1	2
71.	Buying illegal fur	0	0
72.	Poisoning fish	29	0
73.	Pollution of stream	1	2
74.	Blocking of stream	39	43
75.	Taking oysters from polluted area	0	0
76.	Transporting fish out of state illegally	0	0
77.	Aggravating assault resisting arrest	1	6
78.	Shooting fish—light and gun	3	0
79.	Catching lizard at night with light	0	2
80.	Arson—Setting fire to State Parks	15	0
81.	Taking turtle eggs illegally	3	4
82.	Firing the feeding and breeding grounds of wild birds and wild quadrupeds	39	53
83.	Hunting deer with 22 rifle	0	2
		3468	3515

Fines 1954 J. P. $35,570.32
Fines 1955 J. P. $34,818.13

VIOLATIONS BY PARISHES

Parish	1954	1955
Acadia	22	31
Allen	24	29
Ascension	96	78
Assumption	34	18
Avoyelles	88	93
Beauregard	24	12
Bienville	35	75
Bossier	37	85
Caddo	117	248
Calcasieu	82	48
Caldwell	18	15
Cameron	52	78
Catahoula	58	31
Claiborne	36	18
Concordia	51	69
DeSoto	14	26
East Baton Rouge	37	27
East Carroll	40	9
East Feliciana	16	15
Evangeline	35	39
Franklin	33	18
Grant	59	40
Iberia	112	39
Iberville	38	22
Jackson	9	13
Jefferson	67	170
Jefferson Davis	50	53
Lafayette	37	23
Lafourche	39	69
LaSalle	32	22
Lincoln	30	3
Livingston	116	130
Madison	49	68
Morehouse	90	41
Natchitoches	83	91
Orleans	188	203
Ouachita	60	34
Plaquemines	55	47
Pointe Coupee	77	31
Rapides	100	96
Red River	23	26
Richland	27	19
Sabine	3	18
St. Bernard	30	22
St. Charles	87	100
St. Helena	20	16
St. James	20	30
St. John the Baptist	60	37
St. Landry	116	53
St. Martin	63	32
St. Mary	35	38
St. Tammany	217	353
Tangipahoa	128	93
Tensas	47	46
Terrebonne	75	47
Union	25	19
Vermilion	37	73
Vernon	43	46
Washington	84	77
Webster	13	48
West Baton Rouge	25	14
West Carroll	7	12
West Feliciana	14	11
Winn	29	23
	3468	3515



Enforcement Districts.

Appearing in court is a vital part of the enforcement program.

A great number of cases were handled in the State Courts and the U. S. Federal Courts. Minor violations were taken to State Justices of the Peace where the defendant was permitted to pay a civil penalty. These penalties paid in the Justices of the Peace Courts were collected through the Commission and then turned over to the local school boards where the offenses occurred for use for Public Schools. During 1954 the sum of $35,570.32 was collected through Justice of the Peace Courts for school boards. The incomplete figure for 1955 shows the sum of $34,818.13 paid in penalties before Justice of the Peace Courts.

Chief John McGee with captains and supervisors.

AVIATION SECTION

John F. Ellington, Chief Pilot

Chief Pilot John F. Ellington

This report of the Aviation Section of the Louisiana Wild Life and Fisheries Commission covers the period beginning January 1, 1954 and ending December 31, 1955, and outlines in detail the activities of this airborne group.

Although originally established solely as another unit of the law enforcement division of the commission the Aviation section's activities have so broadened that it is now operating as an advantageous adjunct to all divisions of the agency. A total of 1,827 hours and 20 minutes flying time have been logged during 1954-55 towards actual enforcement of the state's fish and game laws as well as assisting rangers in detecting and apprehending law violators and assisting in the inspection of oyster reefs and waterbottoms for the Oyster and Water Bottoms Division of the Commission.

Assisting in the work of making biological tests, transporting scientists and providing them an opportunity to study from the air certain conditions and formations that would be far less discernible from land or water surfaces; assisting the Division of Education and Publicity in the taking of aerial photographs; speedy transportation for outdoor writers and photographers for publications of nationwide scope; transportation for Commission personnel when speedy arrival at a given destination is essential in behalf of public relations, and the transportation of visiting writers on whom the Division of Education and Publicity must rely in publicizing Louisiana's wildlife resources; participating in the taking of game censuses throughout the state, on game reservations and land open to public hunting. Lending a vital service to individuals where rescue work is urgently needed before and after storms; aiding in the rescue of persons and valuable wildlife during floods; aiding in the search for lost persons, boats' crews and land water conveyances; being available at all times to aid in the search for drowned persons, for boats overdue at their home ports and all other types of emergency relief and rescue work. Giving assistance to various Federal agencies in their wildlife and conservation work in Louisiana as well as aiding state agencies other

Nat P. Pedro, oyster division pilot, stands with Seabee.

Seabee is off on marsh country patrol.

than the Louisiana Wild Life and Fisheries Commission. Full cooperation with all divisions of the Commission wherever and whenever an airplane is needed to make their work simpler and more successful.

The consolidation of all the operation and maintenance of the Aviation section under an individual head has greatly improved the service of this section and at the same time has provided a closer check on the cost of the maintenance and operation of this unit. Daily reports are being kept showing in detail the daily cost of operation and maintenance and the actual expenses of the section has been decreased by at least one-third.

The Aviation section now operates one Seabee and two Grumman Widgeons, all amphibious airplanes, subject to call 24 hours a day. It is safe to say each one of these planes is better equipped now for the work expected of them than when they were new. They have recently been completely overhauled, repainted and up-to-minute apparatuses installed which was not part of their equipment when they were turned out at the factory. All are radio equipped; have been equipped for night flying, and instrument panels installed for blind flying. The Seabee is a three-place plane and the Widgeons are five-place craft.

This section also has its own hangar at the New Orleans Airport with a completely equipped machine and repair shop capable of doing any sort of repair or renovation work needed to keep this flying equipment in A-1 condition.

Mechanics overhaul Grumman Widgeon at Commission hangar, New Orleans airport.

Shrimp are checked for size in the French Market, New Orleans, by a ranger.

The personnel of the Aviation section consists of the Chief Pilot and two other fully accredited pilots, each of long experience in aviation; three mechanics and one mechanic's helper and a stockroom clerk-typist. Detailed reports of the work done by each of these individuals, as well as the cost of the maintenance of the section is submitted semi-monthly to the director of the Commission.

During the last few years considerable favorable publicity has been given this Aviation section of Wild Life and Fisheries Commission by several leading magazines. One publication in particular, THE SATURDAY EVENING POST, singled out this unit as the outstanding one of its kind in the United States and carried a most colorful account of the activities of Louisiana's flying game rangers, along with pictorial matter showing how they "got the job done."

In this streamlined world, flying game wardens are not exactly a new thing, but the Louisiana Wild Life and Fisheries Commission is finding its flying wardens extremely valuable in the enforcement of the fish and game laws. And the law violator has found that the approaching drum of an airplane motor is a forerunner of apprehension.

In the days before the airplanes were put in use by the Louisiana Wild Life and Fisheries Commission, fish and game violators played a merry game of tag with agents in the Louisiana bayous and marshes. Knowing the labyrinth of canals, bayous and lagoons as they knew the decks of their own boats, they had little difficulty in dodging the enforcement officer. But they don't dodge the radio-equipped planes.

Ducking into shallow bayous or marshes, where the patrol boats of the Commission can't go, doesn't give them sanctuary, either. A patrol plane pilot can spot the violator, radio his location and direct boat-borne officers to him, if necessary. Or, if the water or terrain is suitable for landing, the flying warden can make the arrest himself.

"Flying Squadrons" of rangers are being employed with excellent results in all parts of the state. These units are sent out from headquarters as special squads wherever violations of a consid-

Grumman Widgeon leaves New Orleans airport for patrol.

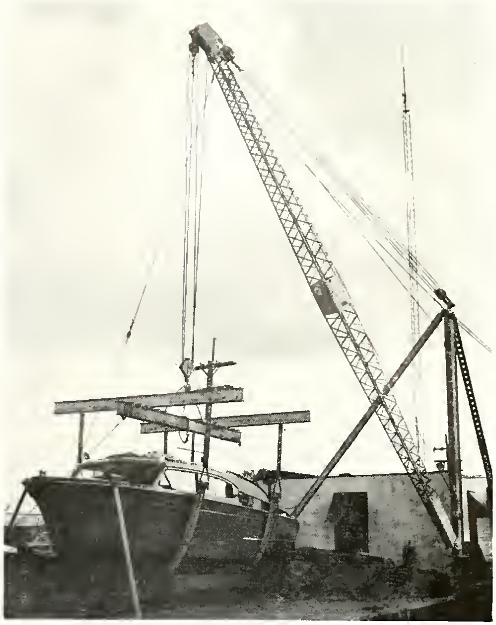
erable number are reported. Because they are now known in the areas into which they are rushed, they are able to avoid the identification which too many times warns the violator to get under cover, and in a few hours they have been known to entirely clean up communities where illegal hunting and fishing has been reported. The work of these squadrons is increasing daily and the effect is being felt throughout the entire state, with the result that much game and countless fish are being saved from illegal destruction.

That the Aviation section has become one of the important cogs in the machinery of the entire Wild Life and Fisheries Commission is unquestioned. Aside from its value as a law enforcement unit, the speed with which this air service can get division personnel to distant points means a great saving in time and money. Trips that would take eight to ten hours by automobile or boat may be made in an hour or less by airplane. The speed with which the world moves today must be matched if we are to keep pace.

MARINE SECTION

The fleet of the Marine Section is now comprised of the Patrol Boat Zoric, 55 feet in length; Tarpon, 50 feet in length, and the Black Mallard, 55 feet in length. In addition, six 29-foot Chris Craft twin engine boats and two Safti Craft 30-foot twin engine steel hulls, have been added to the above mentioned fleet. These craft are stationed at strategic points throughout the State and can be put into operation at a moment's notice.

The following equipment has been purchased and assigned to enforcement personnel throughout the State. Approximately one hundred-fifty Tee Nee trailers, one hundred-fifty AN 14′ Arkansas traveler hulls, forty UT 14′ Arkansas Traveler hulls, sixty-one 5½ H.P. Johnson motors, one hundred 10 H.P. Johnson motors and seventy-two 25 H.P. Johnson motors.

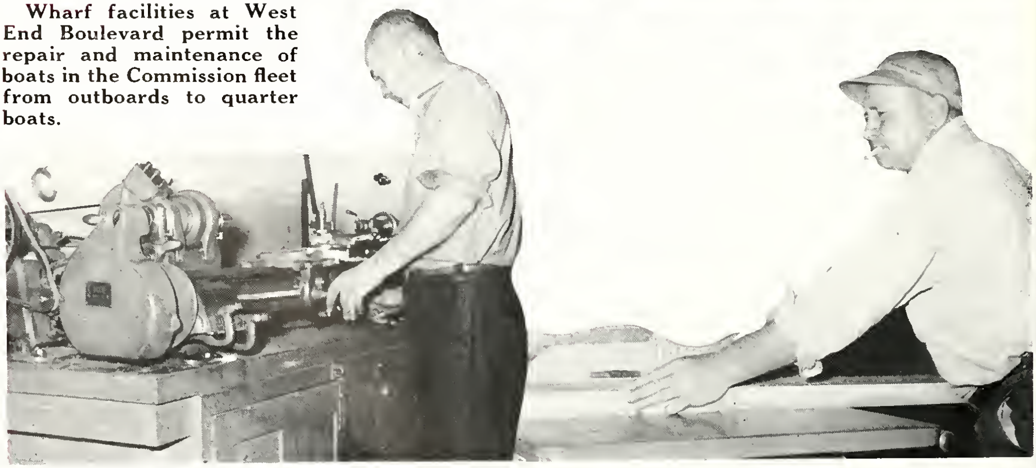


A boat is hauled out for repair at the Commission's wharf, West End Blvd., New Orleans.

The marine section of the Division is located on the New Basin Canal at 7612 West End Boulevard, New Orleans, and consists of a repair shop which is capable of doing repair work on the department boats. There is a carpenter shop, outboard motor shop, machine shop and warehouse for stock parts and materials, and also a fixed radio transmitter with remote control to the main office which makes it possible to keep in radio contact with the boats, planes and mobile units stationed throughout the state. This is done by relaying messages through the new towers that are stationed throughout Louisiana.

Rangers underway on routine water patrol.

Wharf facilities at West End Boulevard permit the repair and maintenance of boats in the Commission fleet from outboards to quarter boats.



Radio Engineer Arthur P. Kay checks radio in mobile unit.

The above mentioned figures are in line with the long range program set up by this Division in 1952 whereby each ranger is equipped with a boat, motor, and trailer suitable to the requirements of his particular area.

RADIO SECTION

In June 1955 the Commission authorized acceptance of a bid amounting to $116,306.80 for a Statewide Radio System.

Several objectives were in mind in the installation of a radio system. A few are:

1. Instant communication with men in the field, thereby saving time and money for the State. No longer is it necessary to telephone several places trying to locate someone. Telephone toll calls are greatly reduced and many automobile trips are eliminated by the use of radio.

It has been proven many times over that radio equipment in vehicles saves the owner a minimum of five cents a mile.

2. In operating airplanes in patrol duties over marsh or swamp area, there is always a large element of danger to personnel due to accidents, forced landings or other emergencies. By installing radio at the various wildlife camps where someone is always on duty, there is some measure of security. In case of trouble a pilot can radio for help and he is assured aid will be summoned from the nearest available place. Not only the camps, but the district office stations maintain a careful watch on the radio, and these are supplemented by mobile units in operation at any particular time.

3. In the event of a national emergency the radio system will be of very great assistance to Civil Defense. The State is in the process of being blanketed by seven main stations with 250 watts power operating into an antenna on top of a 300-foot steel tower.

Three hundred foot towers are installed at Baton Rouge, Rockefeller, Ragley, Alexandria and Monroe. Two additional 300-foot towers will be constructed as soon as clearance is granted by C.A.A. and Federal Communications Commission. These will be located at New Orleans and Minden.

Presently operating 300-foot tower locations with 250 watts power are stations at Baton Rouge, Monroe and Rockefeller, and in each case the predicted effective range has been exceeded.

Supplementing this coverage are 13 stations of 60 watts power each operating into an antenna on top of a 140-foot tower. Of the 13 stations, nine are now operating, located at Grand Pass, Bay Gardene, Pass-a-Loutre, Sister Lake, Marsh Island, Red Fish Point, Abbeville and Sabine Pass. The other four stations will be erected as soon as lands and housing facilities are made available. These stations effectively blanket the coastal region and provide reliable communication to patrol boats operating in these waters and also allow reliable contact with the main office. There are 20 patrol boats equipped with radio and at least six more are planned to be so equipped. The normal range of a boat radio is 20 miles over water, boat to boat, and the average range from boat to the station can be up to 75 miles over water.

The normal range of an office station of 250 watts power operating into a 300-foot tower will be approximately 70 miles talking out to a car, the

Radioman Clarence Guidroz installs radio in airplane.

Making use of the two-way radio system installed in 1954 on a statewide hookup.

talk back range from car to station will average 45 to 50 miles; provided there are no hills or heavily wooded areas between.

There are 51 enforcement cars equipped with radio and an additional 24 radio units have been ordered. Forty-five additional mobile units are used by other divisions of the Commission and the showing made in these divisions has justified orders for 36 additional units to be placed.

It can easily be understood how a captain can coordinate his men in a given area for greater and more effective enforcement by the use of radio contact. The normal range of a radio car is approximately seven to 10 miles from car to car. It should be emphasized that the range of car to car transmission will be greater in most instances, but this is due to certain weather conditions, altitude of car, location and other factors, and for this reason, it should not be assumed that the radio is not working properly if a certain vehicle talks out 50 miles one day and not more than 10 miles the next day.

Four airplanes are radio equipped and are giving good service, car to plane, plane to plane and plane to office. Coordination between plane and boats checking for violators and pollution control has proven to be very effective.

Eight Handie-Talkies are in use and have proven effective in the use of apprehending people using shocking machines for fishing purposes. It is a convenient method of communication from a ranger hidden out, to a ranger in a plane or car some distance away.

One radio unit that has proven exceptionally useful has been the one installed in the Marine Mechanics truck, operating from Oyster and Water Bottoms Division. With a wide area to cover, and in most cases out of range of normal communication facilities, this unit has been able to do considerably more work per day and is always available on call.

During the hurricane season the radio facilities have proven very valuable in communication with camps. In one instance during 1955, when a hurricane struck near Waveland, Miss., several shrimp boats made their way through the storm to Grand Pass Camp and rode out the storm. By using the camp radio facilities their families were notified of their safety and needless anxiety prevented.

Statewide radio maintenance is handled by three radio technicians who also repair electronic equipment on the boats such as fathometers (depth indicators). Ship to shore radio telephone, etc. Another duty of the radio technician is to check the operation of heavy duty generators, on boats and cars, check fan belts for proper tension, check battery charge and general operating condition and to make necessary reports, requisitioning repair or replacement. The actual generator repairs and installations are not done by the radio technicians, such work should always be done by people specialized with this equipment.

Operation of the stations in the various offices is handled by stenographers or other persons available. This is not the best method as at times there is a large volume of radio traffic which prevents the stenographer from doing other work. Naturally as additional mobile units and stations are added, this traffic load will increase considerably. Operating hours at present are 8 A.M. to 5 P.M. We hope to increase the operating hours in the future so as to provide communication to rangers working late at night.

A trapper is checked for license in the field.

Division of

Fish and Game

During the past two years the Division of Fish and Game of the Louisiana Wild Life and Fisheries Commission has continued its dynamic approach in the management of the game and fish activities in the State. The basic functions are the same, but have been and will continue to be altered to meet the changing biological, economical and sociological conditions in the State. Further efforts have been made to reduce those practices which have become obsolete, due to the ever-changing ecology. The Division has been streamlined for more efficient operation and greater benefits to the sportsmen of Louisiana will be derived as a result of this efficient operation.

The aims of the Commission are to promote, protect and utilize the fish and game resources of the State to the fullest possible extent. To do this, each employee and each citizen must realize the tremendous values of these resources to the economy of Louisiana, each one of us must be ever vigilant to detect changes that will adversely reduce these values; and each one of us must consider it our individual responsibility to combat those factors which are taking away and wasting our resources. To detect changes and determine methods of combating decimating factors, it is necessary to have proper and adequate machinery. In the case of fish and game management proper and adequate machinery means well-trained and sufficient personnel for the job. Only qualified personnel through planning and adequate research can dig out those forces which are continuously cutting away nature's stabilizing efforts. Only through sound studies can the economy of the state continue to progress and yet hold the drain on our natural resources to a minimum. Progress and recreation are compatible if all of us fully appreciate the values of our natural resources and work together rather than selfishly.

George C. Moore, Chief

All of us realize that certain changes are inevitable which will reduce, or in some cases, increase the fish and game potentialities. It is the aim of the Fish and Game Division to take advantage of this knowledge and manage the game under each environmental condition to its maximum benefit. With this in mind, we are trying to improve our lakes by taking advantage of the latest techniques. We are studying the lakes, streams and impoundments throughout the state to determine what we have, what the conditions are and what can be done to improve them. We are study-

Chief George Moore (extreme right, back row) and PR-Coordinator John Campbell (front row, extreme right) call biologists into session for quarterly meeting.

ing those factors that are deteriorating our lakes and streams to determine what may be done to reduce or offset this destruction. We are trying to give the maximum and best information to all the sportsmen so they can better help themselves.

Our game range is being changed daily. Some for the better, some adversely and some completely eliminated. We are trying to find ways to manage each game range to its maximum carrying capacity for each existing condition. To offset some of the losses, a major objective of the Louisiana Wild Life and Fisheries Commission is to establish large tracts of land where game will become a primary crop. From these lands, we hope that wise management and harvest will always guarantee a place for our citizens to hunt and fish.

Louisiana's natural resources have unlimited potentials. It is the duty of the employees of the Louisiana Wild Life and Fisheries Commission to develop, restore and guard them. Our hyacinth

Duck concentration in the hardwood country of north Louisiana.

control program is designed to restore some of the excellent fishing which once existed.

Louisiana's natural resources will continue to grow and flourish by the application of facts gathered in its research program, by applying management and restoration, by guarding and rationing through its enforcement and, by carrying out an all-around dynamic program through the combined efforts of all of its employees and the continuous support of the public.

The Fish and Game Division, for more efficient operation, has been streamlined into five sections. All sections formerly listed are included in one of those listed below and a brief report of the activities during the last two years follows:

River Basin Studies Section

Theodore B. Ford, Supervisor

The preservation of good fish and wildlife habitat is important to all citizens of Louisiana. In the past 30 years, many water control projects have been initiated or completed which have had adverse effects on fish and wildlife populations. For some time, the effects of these projects passed unnoticed since fishing, hunting and trapping opportunities abounded in Louisiana. Then as these animal populations became reduced, in general, as the ecological changes occurred, people began realizing that something undesirable was happening. Few people recognized or were willing to accept the fact that these detrimental effects on our fish and wildlife resources were directly associated with the ever-increasing number of water control projects. This picture has changed. Now, there are many people in all parts of Louisiana who are deeply aware of these problems and, yet of greater importance, are interested in preserving and developing our fish and wildlife resources and their habitat.

The newest biological section of the Fish and Game Division of the Louisiana Wild Life and Fisheries Commission is the River Basin Studies Section which was established in 1955. The nuclear staff is composed of three professionally trained biologists. The objective of this section is to evaluate biologically all water control projects in Louisiana, from the hills and alluvial delta on the north to the marshes on the south, to determine what ecological effects a proposed project can be expected to have on fish and wildlife. In making this evaluation, the biologists of this section work with other technicians of the appropriate divisions of the Commission in co-ordinating the study and compiling data relative to the project.

River Basins work supervisor Ted B. Ford

If it appears evident that losses to fish and wildlife habitat will occur, efforts are made to reduce these losses or convert losses to benefits by making recommendations to the planning agency for modifications of the project plan or use of an alternate route. Frequently, an alternate route could be utilized without endangering an area high in value for fish or wildlife and yet low in value for other purposes according to the land capability. In certain instances where projects will detrimentally affect large areas high in fishery and wildlife resource values, the Commission forthrightly opposes the project in a statement of public record. Generally speaking, better cooperation and understanding is developing between the Commission and planning agencies who are not aware of all the effects of their projects.

River Basin Studies have been in progress since 1951 on a part-time basis in conjunction with the regularly assigned duties of some Fish and Game Division personnel. It was not until 1954 that a full-time biologist was employed to assist in the evaluation of these projects. Subsequently, in 1955, two additional biologists were employed to meet the increasing personnel needs

Geese high overhead

for field work, study of plans and reports and representing the Commission at meetings and conferences dealing with water control.

A well-balanced program is underway. The Commission opposed proposals for backwater and flood control work in the Red River Backwater Area when a preliminary survey and evaluation of the area disclosed that countless thousands of people use it for recreational purposes and that the annual value derived from commercial and sport fish and hunting is several million dollars. This project was suspended. A low water weir, suggested by the Commission, will be included in the Amite River and Tributaries Project diversion canal for maintaining a low flow down the main channel of the river to Lake Maurepas. An ecological study is being conducted in the project area of the Amite River to determine what and when changes occur. The Commission strongly opposed a proposed water control project for the Catahoula Lake Area. This large sump area works efficiently under natural conditions and is the key to the success of waterfowl hunting in North Louisiana. Anything which would disturb these conditions would seriously endanger the overall usefulness of this lake. Preservation and development plans are being prepared for segments of the Mississippi River and Tributaries Project not yet completed.

Fish and wildlife development and management plans and work is being coordinated for sections of the Fish and Game Division for the Bayou Dupont Watershed project. This is a water control project involving twenty-two impoundments with a total flood pool area of over two thousand acres. Commission statements outlining anticipated effects on fish and wildlife resources have been made as a matter of public record for all federally proposed water control projects since 1954. The Commission has also been represented at meetings and conferences with other agencies in order to establish the place of wildlife, fisheries and recreation as an integral part of general land management in Louisiana.

The final report of the Arkansas-White-Red Basins Inter-Agency Committee was completed in 1955 following five years of study. This report deals with the comprehensive plans of federal and state agencies for various needs and uses of water and other natural resources within the area. Cooperative work between Commission biologists and the Fish and Wildlife Service personnel produced the survey, inventory, opportunities and needs for fish and wildlife resources. It is hoped that any future water control work within this area will be performed within the framework of the comprehensive, multiple purpose uses covered in this report.

Engineer William Acklin

Finally, good public relations with people over the state has been enjoyed. Providing information and an opportunity for developing an understanding of the problems associated with water control projects is a slow process. More citizens of Louisiana are thinking in terms of multiple purpose uses of water and comprehensive plans for all needs including fish and wildlife. This is one of the policies under which the Commission is operating and is being favorably received by those acquainted with it.

Land Management Section

Raymond D. Moody, Supervisor

Raymond D. Moody, Supervisor, Land Management Section.

This section of the Fish and Game Division was set up to provide public hunting areas to the general populace of the State of Louisiana.

In general, the aim of this section is to acquire land, and develop same for various species of game to be harvested by the majority, excluding none.

At the present time, only one area is limited in the number of people that may participate in a hunt. The limiting factors in this instance are housing facilities and transportation.

In addition to the public shooting areas, this report also includes a short resume on predator control by Thomas E. (Doc) Harris, and the "Quail Development Areas" by Henry D. Roberts.

Public Shooting Grounds

At present, the Wild Life and Fisheries Commission manages 18 game management areas located throughout the state, comprising a total of approximately 357,500 acres. All of these areas are either owned by or leased to the Commission for game management purposes. Development work on these areas consists principally of habitat improvement, enhanced law enforcement, game restocking wherever necessary, and an aim toward harvesting the surplus. See Figure 1 for names, location and approximate size of the game management areas now in effect.

Three game management areas, Evangeline, Catahoula and Livingston were open to the public for squirrel hunting in 1954. Evangeline and Livingston each had a 15-day season, and Catahoula had a seven-day season. Approximately 4,000 hunters took advantage of the open squirrel season on these areas for a total squirrel bag of 6,400 animals.

In 1954, five camps were constructed at Pass-a-Loutre for the purpose of accommodating duck hunters desiring to participate in the public hunts on this area. These buildings, 16′ x 24′, were equipped with beds, mattresses, hot plates and cooking utensils for the convenience of the hunters, and to cut down supplies being brought in by the hunter, necessary for his comfort, to facilitate transportation. Pass-a-Loutre is located at the mouth of the Mississippi River some 15 miles southeast of Venice, Louisiana, and all transportation south must necessarily be by boat.

Hunters were accepted for duck hunts on this area by written application to the Louisiana Wild Life and Fisheries Commission. After checking in at Venice, and having been assigned a camp, the duck hunters were transported to the various camps by boat, where everything was in readiness including duck boats, decoys and ponds to shoot. After a two-day hunt, the parties were then picked up and transported back to their automobiles at Venice.

Approximately 500 duck hunters were accommodated at Pass-a-Loutre in this manner during the 1954-1955 waterfowl season.

Six additional camps were constructed at Pass-a-Loutre during the summer and fall of 1955 to accommodate additional hunters during the 1955-1956 waterfowl season. Four of these

Dragline digs canals on Pass-a-Loutre to permit entrance into ponds by public hunters.

camps, two of which are built on floating barges, were increased in size to 16′ x 32′, and two of the camps built to accommodate man and wife are 16′ x 48′, with five individual rooms. This increased the number of people that could be taken care of from 100 hunters each week to 200 hunters each week, and also provided for women to participate in the hunts. Approximately 2,800 hunters were taken care of at Pass-a-Loutre in the 1955-1956 waterfowl season, for a total duck kill approaching 7,500 ducks, and 326 geese bagged.

Eight existing game management areas were opened to squirrel hunting during the 1955-1956 season. These areas were as follows:

Name	No. Hunters	Squirrels Bagged	No. Days
Evangeline	230	249	15
Livingston	1072	1971	15
Sabine	454	535	15
Union	241	528	15
West Bay	1918	3607	15
Grant-Rapides	2540	5281	15
Jackson-Bienville	1758	3518	15
Red Dirt	225	252	15
TOTAL	8,438	15,941	

In addition to the squirrel season on Red Dirt, a 15-day quail season and a seven-day deer season was enjoyed by the nimrods. One hundred and twenty-seven hunters participated in the 15-day public quail hunt on this area, for a total bag of 400 birds. Approximately 2,000 deer hunters took 90 buck deer off this same area in the allowed seven-day public hunt.

Several areas were acquired, by lease, during the year 1954 and 1955 which have been or will be developed for waterfowl and or other game species for the benefit of the public hunter and fisherman. Below is a brief description of the latest areas under lease to the Louisiana Wild Life and Fisheries Commission, as public shooting grounds.

Lafourche Game Management Area

The "Lafourche Game Management Area," referred to as the Richland Parish Waterfowl Shooting Area, is a 1,780-acre tract of land owned by the United Gas Company, and is located in the Bayou Lafourche bottomlands approximately 10 miles east of Monroe, Louisiana, on Highway 80 in Richland parish. At one time this area was flooded naturally and held water for excellent waterfowl shooting but with the Lafourche drainage program, this area has not been capable of holding water.

This past season, with permission from the United Gas Company, the Commission and the Richland Parish Wildlife Federation, with assistance from the Richland Parish Police Jury, filled in the spoil gaps on the east banks of Bayou Lafourche in an effort to flood this area. Depending upon rain water it was very slow in filling up and did not furnish any shooting until the end of the season.

Plans are now in the process of securing water from Crew Lake by a control structure which is to be constructed by the Louisiana Department of Public Works for flooding the Lafourche area.

A total of 30 native Louisiana deer from the Red Dirt Game Management Area and Madison Parish were released south of this area in February and April of 1955.

Workmen put finishing touches on one of public shooting camps at Pass-a-Loutre.

Fish and Game Photos

Closing water control structure gate on Shiloh public shooting area.

Morehouse Parish Public Shooting Area

The Shiloh Creek area is a 1,200-acre tract of land belonging to The Crossett Lumber Company, located approximately four miles west of Vaughn, Louisiana, and borders the Terzia Game Management Area in Morehouse parish. This area was primarily constructed and developed for waterfowl shooting.

To make this area, a dam 415 feet in length was put across Shiloh Creek. The dam is five feet in height with a 15-foot crown. A pipe thirty inches in diameter and twenty feet in length with a water control gate was installed so that the water may be regulated.

Bayou Bodcau Public Shooting Area

This is a 37,000-acre tract of bottomland lying to the north of the Bodcau Dam in Bossier and Webster parishes. This area belongs to the U. S. Army Corps of Engineers and has been leased to the Commission for game management purposes. Although no definite work plan has been developed, it is the general plan of the Wild Life and Fisheries Commission to flood portions of this area each fall for waterfowl shooting purposes. Plans for its development are underway and a possible cooperative project will be entered into with the Department of Public Works.

The Burn Waterfowl Shooting Area

The Burn area is a 1,500-acre tract of privately owned swampland located along the Calcasieu River approximately five miles north of Lake Charles. In its natural state, it provides excellent duck shooting when water conditions are favorable. A survey has been conducted to determine the feasibility of constructing a stop log dam, for the purpose of maintaining a certain water level. Water fluctuation will be possible and desirable.

Grassy Lake Public Hunting and Fishing Area

The Grassy Lake area is a 26,000-acre tract of swampland along the Red River in the eastern portion of Avoyelles Parish. This land is the property of the Southwestern Land Development Company and is leased to the Commission for public hunting and fishing. In its natural state it provides some of the best fishing in the south, in addition to fair duck and squirrel hunting and a limited amount of deer hunting. Plans are being made to improve the waterfowl hunting by creating a number of shallow impoundments. The deer hunting will be improved by additional enforcement. The area will remain open to the public for hunting and fishing.

Wisner Foundation Lands

This 30,000-acre tract of marshland is located mainly in Jefferson Parish, approximately five miles south of Leeville, along the Grand Isle high-

Constructing dam on the Shiloh Creek public shooting area.

Filling spoil gaps on the Lafourche public shooting area.

Fish and Game Photo

Checking salinity of lower Bayou Lafourche.

way. It is owned by the City of New Orleans and is leased to the Commission for a public waterfowl shooting area. Under present conditions this is a relatively poor waterfowl area; however, plans are being made to improve the habitat conditions and thus attract more ducks. It will require two to three years to complete the development program on this area, but present plans will permit public hunting, beginning next season.

Predator Control

Thomas E. Harris, Supervisor

Our work has been greatly curtailed compared to the past. Only one trapper, Allen L. Hawsey, has worked full time.

Work was done during the summer and fall months at the Public Shooting Grounds at Pass-a-Loutre in 1954 and 1955. In the spring of 1955, work was done in collecting ownership data and getting leases signed for Game Management area in Grant and La Salle parishes.

The most serious problem during this biennium was the outbreak of rabies among foxes in De Soto parish beginning in October 1954. The writer, as predator control supervisor, met with the De Soto parish police jury where arrangements were made for the parish to hire a temporary trapper and the state wildlife commission also hired a temporary trapper and assigned C. W. Elam, a ranger of the Enforcement Division, to assist in the fox trapping program. The writer contacted school bus operators and others who were interested and much valuable assistance was utilized at no cost to the parish or state. We started our program there on November 18, 1954, and completed it on March 21, 1955, with the following results: 653 foxes and three wolves were destroyed. The state trappers, who include T. E. Harris, A. L. Hawsey and temporary state trapper, Hershel Fargerson, trapped 379 foxes and three wolves. The parish trapper, Rollie Creech, trapped 118 foxes and the others including Mr. Elam destroyed 156 for a total of 653 foxes and three wolves.

According to records of the U. S. Fish and Wildlife Service, rabies among foxes usually occurs during a period of high fox population. The only remedy for preventing rabies among foxes would be to prevent over population which would be impossible without great cost. Game management research has shown that a normal population of foxes is beneficial to small game because of the rats and other rodents they destroy there by leaving more feed for birds, etc.

Another of our problems is keeping the bobcat population under control, on the wild turkey ranges, particularly in Madison and Tensas Parishes where Mr. Hawsey has done an excellent job.

Another major problem is controlling predators in areas where cotton farmers are using Pekin Geese for controlling grass. In the Cheneyville area one man lost 200 geese to bobcats and other animals, and in the Bossier Parish area the problem is coyotes and red foxes.

In conclusion, here is where most of the predatory animals are located in Louisiana. Wolves in any number are only found in Avoyelles Parish in Red River swamp across the river from Concordia Parish. There are a few scattered in the Tensas River swamp, Morehouse Parish. Caldwell, Winn, Jackson, Grant and Rapides report a small number of wolves.

Coyotes have invaded Louisiana from Texas principally in De Soto, Caddo, Bossier and Red River Parishes.

Shiloh Creek public shooting area dam.

Fish and Games Photos

Dogs are used to take quail census on quail project.

Red foxes are numerous along Red River from Natchitoches Parish to the Arkansas line.

Bobcats are numerous in the central part of the state which includes Winn, Grant, South Natchitoches, Rapides, Avoyelles, St. Landry, Pointe Coupee and Concordia; and in the Northeastern parishes of Madison, Tensas, Catahoula, East Carroll and Morehouse, and Jackson and Bienville in the North Central part.

Foxes are prevalent over most areas of the state and a very high population exists in the northern parishes.

Plans for the future, especially where predators are destroying geese, in the cotton fields is to train the people who are suffering losses to control the animals themselves, where possible, and concentrate our efforts on protecting wild turkey, birds, etc. The total results of our work from July 1, 1953, to June 30, 1955, is as follows:

Skunks, 277; Bobcats, 157; Wolves, 19; Armadillos, 18; Foxes, 977; Raccoons, 365; Owls, 1; Hawks, 1; Beavers, 17 (trapped and transplanted); Wild dogs, 25; Wild House cats, 68; Oppossums, 302. Total—2,145.

Quail Development

Henry D. Roberts, Project Leader

Early in 1955, a statewide Quail Development Project was set up, consisting of two study areas in each district as nearly identical as possible. In each district, one of these areas will be closed to hunting, while the other is unrestricted. Any wildlife development work done on one area will also be done on the other, thereby keeping them as identical as possible, so as to allow for a study and comparison of quail populations, over a period of several years, on the hunted versus the unhunted areas.

There will be considerable experimental work done with the planting of various agricultural crops which are known quail food, and probably some work with plants which are possible sources of quail food but which have not yet been proven.

Each area is to be very carefully censused for bird coveys, with each covey location to be plotted on a map of the area. There is a buffer zone of approximately one-quarter mile in width surrounding each area. This zone will also be censused. The areas within a district, consisting of 500 to 1,500 acres each, are located at least five miles apart, except in the case of District II, the Monroe District.

Land leased for this purpose totals 10,780 acres, consisting of 5,566 acres for "hunting" areas and 5,214 acres for the "no hunting" areas. Approximately 150 acres have been cultivated and planted (also fenced, when necessary).

Crops planted this year consist of soybeans, common lespedeza, millet, peas, grain sorghums (black amber, Orange, and Hegari), lespedeza bicolor, lespedeza sericea, sunflower, vetch and wheat. Generally, the various seeds for each food plot were selected, measured, thoroughly mixed, broadcast, and covered. This gave a mixture of three to six kinds of plants in each food plot, thereby having seed mature at several intervals. Some of the "slow growing" plants were heavily retarded by the more "rapid growing" ones, and in some cases quite a few of the slower ones were "choked out." In no case, however, was any one of them shaded to the point of complete failure. In general, there was a good to excellent seed yield on the majority of the types planted.

Although the selection of the areas was completed too late to allow for a covey census on all areas, the work of fencing, breaking and planting was completed early enough to give good, heavy stands of plants for cover, and to supply an abundance of seed for food.

Several coveys have been flushed within close proximity to some of the food plots, and three or

Area prepared for the planting of lespedeza bicolor on quail development areas.

Fish and Game Photos

Supervisor Kenneth Smith, District VII, and Clifford T. Williams check 1-1 lespedeza bicolor plants on quail development project.

four coveys have been flushed from food plots. In District IV, crops were collected from some of the birds taken from the "hunting" areas. Three of these crops were full of cattail millet and four were full of hegari and peas. There have been numerous other unverified reports of birds seen or killed in this and other districts. Although a complete census was not taken in the spring before the coveys began to break up and "pair off", an effort will be made to census all areas at the end of the hunting season in order to have a figure for comparison with next spring's census, so as to determine natural winter mortality.

Fresh Water Fisheries Section

Harry E. Schafer, Supervisor

The fisheries section is continuing to expand, having had several new projects initiated during the past biennium. Among these new projects are two that come under the Federal Aid in Fish Restoration Act, which is better known as the Dingell-Johnson Act. Under this act states obtain monies for this program from a 10 per cent excise tax on fishing equipment. The amount of money that a state receives is based on the number of fishing licenses sold as compared with the total number of licenses in all states and the ratio of the state's area to the area of the United States. Louisiana receives just about the minimum and, until all anglers (this includes canepole fishing) are licensed, Louisiana will not receive the full amount.

Other new jobs include a fish management program that is compatible with waterfowl management on Lake Bistineau, investigational projects on Caddo Lake, Anacoco Lake and Bayou Pierre Fish and Game Preserve, a rehabilitation project on Cane River, a farm pond extension project, and an improved program for the three state fish hatcheries; this includes new fish transportation tanks which enables the trucks to be used for other projects.

Another new project that should be of great value to the state's fisheries is the noxious weed program. This research project endeavors to ascertain a control of our many noxious aquatic plants that hinder the production and harvesting of fish.

The following are the biennial reports for 1954-55 by the project leaders of each project:

Fish Management Projects

Donald W. Geagan, Leader

State Fishing Projects:

The purpose of this study is to investigate and attempt to solve fisheries problems which occur statewide. These problems include answer-

Bicolor and cowpeas planted on quail area in district No. VII.

Lespedeza bicolor ready for planting

Fish and Game Photos

Picking up fish poisoned during the Cane River operation.

ing inquiries as to the cause for poor fishing, analyzing fish population at the request of local groups such as police juries and sport groups, giving advice regarding construction of new impoundments, identification of fish, and many other subjects.

The following work was done during the biennial covered in this report.

Cane River Lake

Cane River Lake, which is approximately 34.5 miles long and averaging 250 feet in width, was the largest single project worked on during this period. Formerly the lake had provided largemouth bass fishing of such excellence that fishermen traveled from all parts of the country to try their skill. However, during the past several years fishing had dropped off to practically nothing.

During the summer of 1954 the Natchitoches Parish Police Jury requested the Louisiana Wild Life and Fisheries Commission to make a study to determine the cause for the poor fishing and the most efficient and effective way of correcting the situation. It was decided from this study that Cane River Lake was overly populated with both gizzard and threadfin shad and other rough fish. It was decided that a total poisoning operation with subsequent stocking of game fish would be the only method to restore it to good fishing.

This poisoning operation was begun on April 5, 1955 and lasted through July 24, 1955. A total of 23,000 pounds of six per cent powdered rotenone was used. Approximately 378,499 pounds of fish were killed and collected during the operation. Of this, only a very small percentage was game fish.

Lake Bistineau fishway.

Immediately upon the completion of the poisoning operation, a selective concentration of 0.5 pounds per acre foot was applied to the lower 20 miles of the lake. This entire operation cost approximately $19,554.65, which included the cost of the rotenone, special equipment, salaries and expenses. Of this amount, the Natchitoches Parish Police Jury furnished $7,200 towards the cost of the rotenone.

Upon completion of the poisoning operation the lake was stocked with a total of 38,717 largemouth bass averaging four inches in length in groups of 5,000 at five-mile intervals. This is to

Lake Chicot fishway.

Fish and Game Photos

Garfish poisoned in Cane River lake.

be followed up with additional stocking of bass in the spring of 1956.

During September 1955 a one-acre sample was taken in Cane River Lake which showed considerable numbers of small young shad to be present. It was decided to follow up with a selective poisoning. This was begun during October 1955, beginning at the northern end of the lake. Rotenone in a concentration of 0.25 pounds six per cent powdered rotenone per acre foot was applied to the northern 24.5 miles of the lake. It is believed this operation was very successful as large numbers of small shad were killed with only one game fish noted as having been affected. The per cent kill will not be known, however, until next spring when additional samples are to be taken.

Fishways

During this biennial for the first time we had two fishways in operation in Louisiana; one at Lake Bistineau and one at Lake Chicot. The structural characteristics of the Lake Bistineau Way were described in the Fifth Biennial Report and therefore will not be given here. The Lake Chicot Fishway was constructed by the Louisiana Park and Recreation Commission. It is located on the Spillway proper and is 110 feet long and four feet wide. The slope is one to ten. The inside of the way consists of a series of permanent cement baffles placed alternately on each side of the structure. The purpose of these is to slow down the flow of water and to create calm areas where the fish may rest on their journey up the way. At the upper end of the way is a trap which catches any fish using the way.

The traps on both the Lake Bistineau and the Lake Chicot Fishway were raised three times daily during the operating period. At that time all fish in the traps were counted, identified, the rough fish either destroyed or returned below the Spillways, the undersized game fish placed in the lake, and all game fish of available size were measured, weighed and tagged with a metal strap tag and released in the lakes.

The following table shows the period and results of the operation of these two fishways during this biennial:

TABLE 1

Period of Operation

	1954	1955
Lake Bistineau	April 10 thru July 26	May 4 thru July 14
Lake Chicot	May 21 thru June 11	March 14 thru July 11

Total Number of Fish Using Fish Ways

	1954	1955
Lake Bistineau	4,765	5,171
Lake Chicot	268	13,136

The 1954 figures should not be compared to the 1955 figures as the mesh on the Lake Chicot Fishway trap was reduced from one inch to one-half inch and that of the Lake Bistineau from a mesh of 1½″ x 3½″ to a mesh of one-half inch for the 1955 season.

Table No. 2 illustrates the number and percent of game and rough fish and of available game fish using the ways during the 1954 and 1955 seasons.

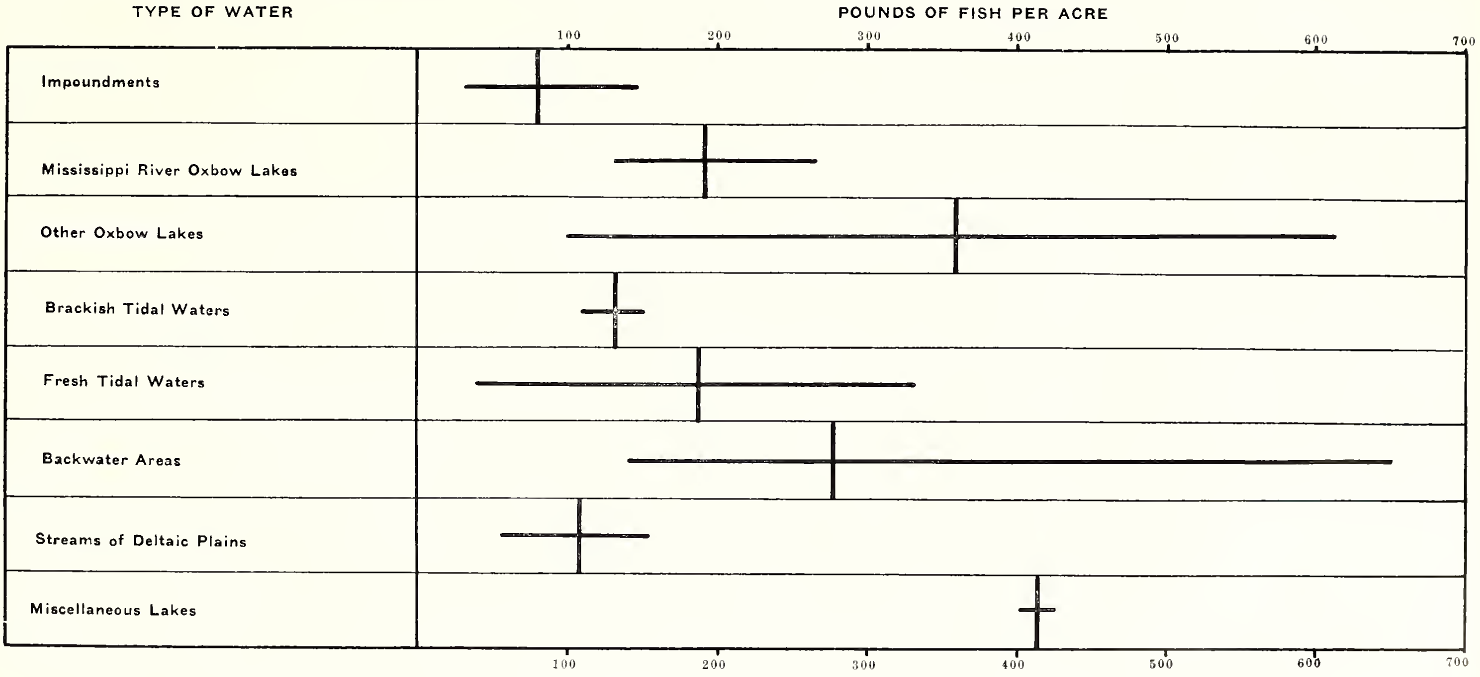
It is intended that this study of the fish using these two Fishways be continued through the next biennial.

While the numbers of fish using the ways appear to be large it should be pointed out that

Lake Chicot fishway operator tagging fish using way.

FIGURE 1

Standing crops of fish occurring in selected study areas representing the major ecological types of fresh water in Louisiana. The standing crops of fish were determined by taking rotenone samples of the fish populations occurring in the study areas. The standing crops of fish for the various bodies of water are summarized under the various ecological types of water. The horizontal lines represent the range of the standing crop for the various types of water. The vertical lines represent the average standing crop for the various types of water. The standing crop of fish is represented as pounds of fish per surface acre of water.



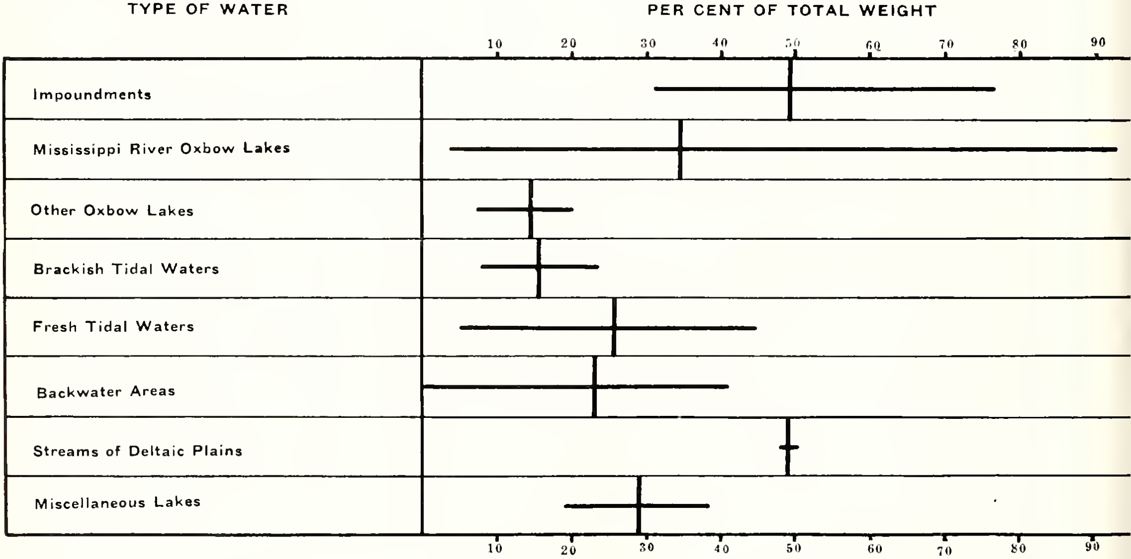
in 1955 of the 13,136 fish using the Chicot way only 578 or 4.40% were game fish of available size. Of the remaining 8,876 game fish 8,126 were small bluegill bream under five inches in length and due to the high reproductive capabilities of this species along with the high mortality rate of its young it is doubtful if these fish had much affect on the population of a lake the size of Chicot Lake. The same is true for the Lake Bistineau way in as much as only 509 or 9.84% of the total 5,171 fish using the way were available game fish in 1955. Of the remaining 778 game fish, 587 were undersized bluegills.

TABLE 2

	1954		1955	
	Number	Per Cent	Number	Per Cent
Game Species				
Lake Bistineau	1,270	26.65%	1,278	24.88%
Lake Chicot	198	73.88%	9,454	71.97%
Rough Species				
Lake Bistineau	3,495	73.25%	3,884	75.12%
Lake Chicot	70	26.12%	3,682	28.03%
Available Game Fish				
Lake Bistineau	600	12.59%	509	9.84%
Lake Chicot	63	23.51%	578	4.40%

FIGURE 2

Per cent fresh water game fishes by weight occurring in fish population as determined by fish population samples taken fr selected study areas representing the major ecological types of fresh water in Louisiana. The percentage of game fishes occurring the various fish populations sampled are summarized under the various ecological types of water. The horizontal lines represent t range of the per cent game fishes for the various types of water. The vertical lines represent the average per cent game fishes for t various types of water.



Impoundment Studies
Black Bayou Lake, Caddo Parish

Funds were made available by the legislature for the raising of the water level of this impoundment in the late summer of 1954. As this department received numerous requests for advice as to the advisability of increasing the water level of lakes for improving the fishing, it was decided that a study be conducted on Black Bayou Lake before and after the water level rise. This increase called for a raising of the water level four feet.

This study was to include the acquiring of information on the fish population, the aquatic vegetation problem, growth rates of the fish and summer creel catch as affected by this increase in water level.

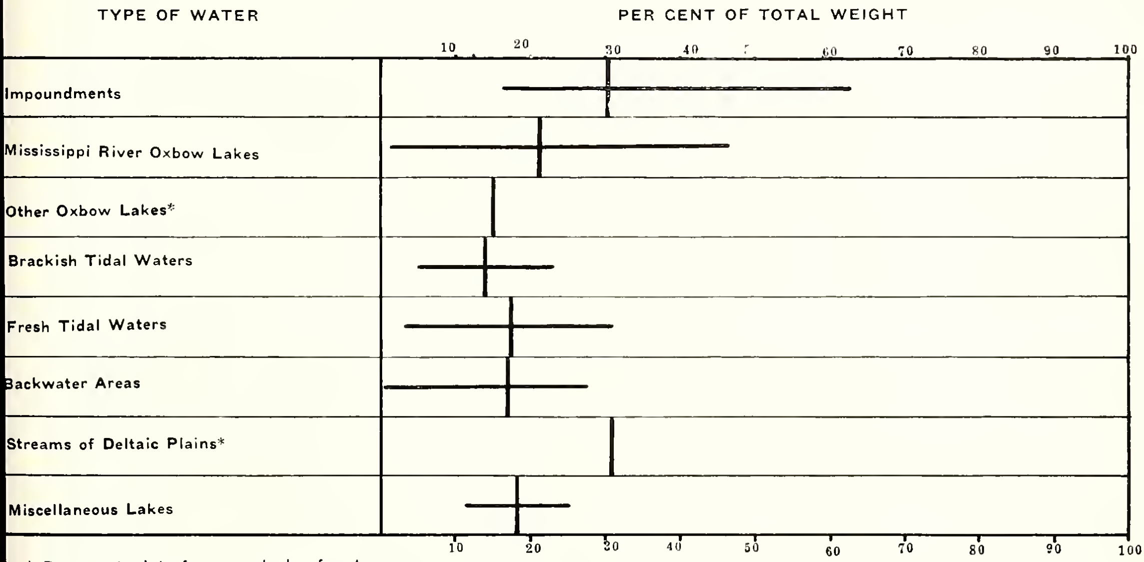
A series of five one-acre fish population samples were taken in 1954 and 1955. These samples were collected by means of blocking off a one-acre area with a one-inch mesh net. Then emulsified rotenone was applied in excess of one part per million by means of a portable power pump. All fish which surfaced and could be collected on the first day were identified, sorted according to species, measured, weighed and recorded. Scales were collected from some of the game fish. The webbing was permitted to remain surrounding the sample area until the following day, at which time all fish which had bloated and floated to the surface and which were missed on the previous day were collected. These fish from the second day were identified, sorted according to species, measured, weighed and recorded.

The aquatic vegetation was type-mapped according to species and their extent.

The summer creel census is conducted during June, July, and August each year and it is hoped that this will reflect any increase or decrease in the fish harvest reaped by the sportsmen. This census is conducted by a student who alternates among the main fishing camps on Black Bayou Lake. A record is made of the number of fish caught of each species along with the total weight and average size. Also recorded is the number of fishermen, the hours fished, and the type of gear used. (See Tables Nos. 4 and 5.)

FIGURE 3

Per cent available game fishes by weight occurring in fish populations as determined by fish population samples taken from selected dy areas representing the major ecological types of fresh water in Louisiana. Available game fishes includes those which are of size t are likely to be harvested by sport fishermen. The percentage of available game fishes occurring in the various fish populations mpled are summarized under the various ecological types of water. The horizontal lines represent the range of the per cent available me fishes for the various types of water. The vertical lines represent the average per cent available game fishes for the various types water.



* Represents data from one body of water

It is planned for this study to continue through the next biennial.

Anacoco Lake, Vernon Parish

A study program was begun in the summer of 1955 on Anacoco Lake to determine the present composition and production of the lake's fish population along with a study of the increasing aquatic vegetation problem.

As the lake presently affords good sport fishing, it is the objective of this study to determine means of attempting to maintain this degree of fishing.

This study includes the collection of four one-acre fish samples with emulsified rotenone as was described in the Black Bayou Lake section of this report. Along with this are to be conducted growth rate studies, aquatic vegetation identification and type-mapping and control experiments, creel census and water chemistry analysis.

The creel census conducted on Anacoco Lake is of a voluntary nature on the part of the sports fishermen. By this is meant that a creel census box is stationed at each fishing camp and in this box are forms to be filled out by the fishermen themselves. This is the first time this type creel census has been used by this section and it is not known as yet how successful it will be. This project is to be continued through the next biennial. (See Table No. 6.)

FIGURE 4

Per cent bass by weight occurring in fish populations as determined by fish population samples taken from selected study areas representing the major ecological types of fresh water in Louisiana. The percentage of bass occurring in the various fish populations sampled are summarized under the various ecological types of water. The horizontal lines represent the range of the per cent bass for th various types of water. The vertical lines represent the average per cent bass for the various types of water.

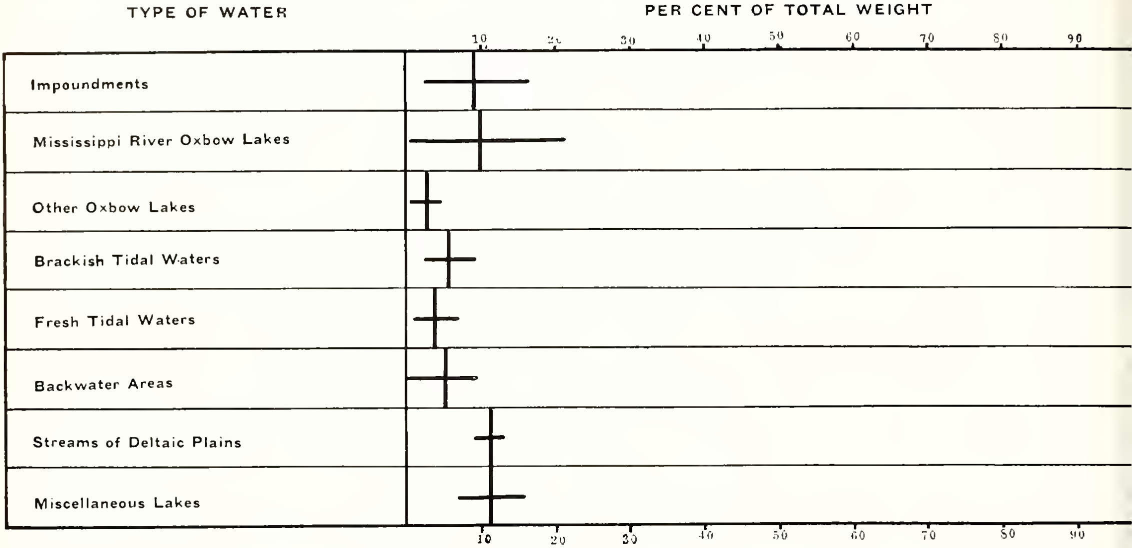
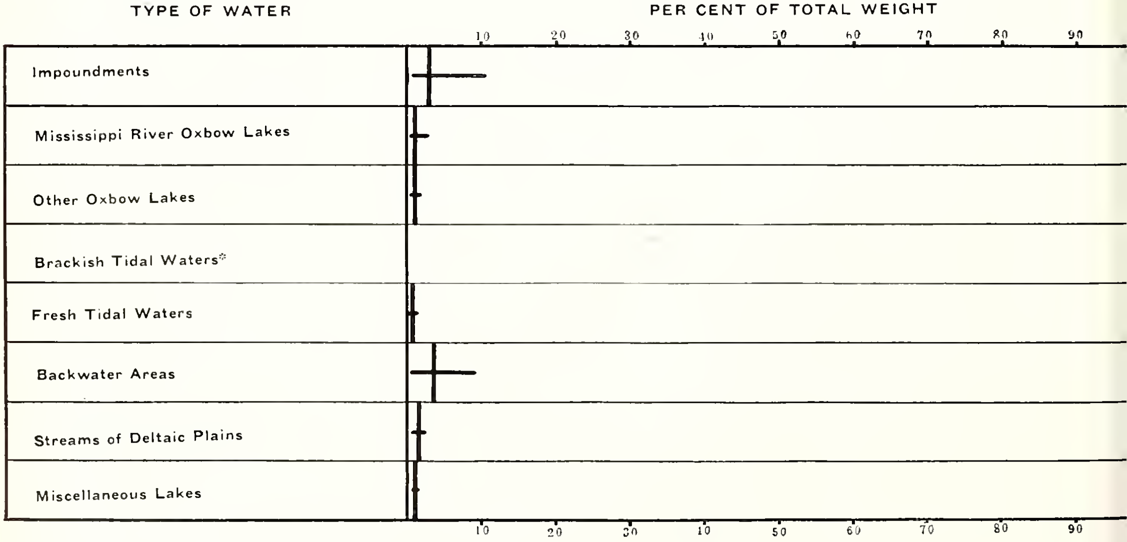


FIGURE 5

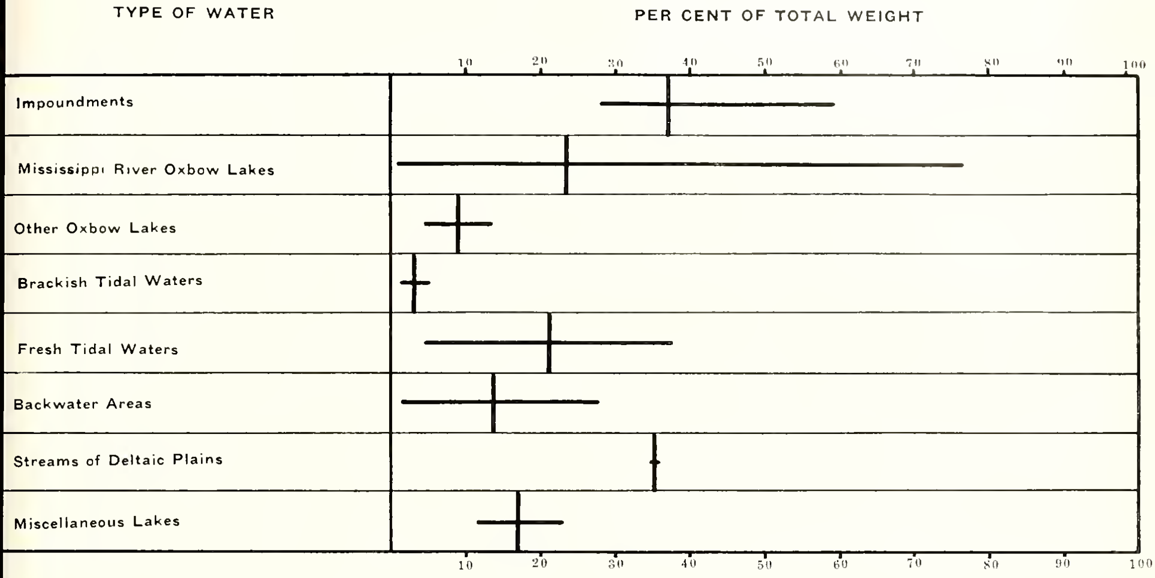
Per cent crappie by weight occurring in fish populations as determined by fish population samples taken from selected study are representing the major ecological types of fresh water in Louisiana. The percentage of crappie occurring in the various fish populatic sampled are summarized under the various ecological types of water. The horizontal lines represent the range of the per cent crap for the various types of water. The vertical lines represent the average per cent crappie for the various types of water.



* Crappie did not occur in the samples

FIGURE 6

Per cent sunfish by weight occurring in fish populations as determined by fish population samples taken from selected study areas epresenting the major ecological types of fresh water in Louisiana. The percentage of sunfish occurring in the various fish populations ampled are summarized under the various ecological types of water. The horizontal lines represent the range of the per cent sunfish or the various types of water. The vertical lines represent the average per cent sunfish for the various types of water.



Caddo Lake, Caddo Parish

In the past Caddo Lake had afforded good bass and crappie fishing but in recent years these have dropped off considerably. A study was initiated in 1954 to determine the production and composition of the fish population in this lake along with any changes over a period of years. Along with this has been conducted studies of its water chemistry, plankton and bottom organisms to attempt to evaluate the lake's fertility and the available fish food present.

It is hoped that through this study it may be determined in what areas of the lake the components of the present fish population are located and if the lake is producing its capacity in pounds of fish per acre.

In Caddo Lake during 1954 a total of 10 one-acre rotenone fish samples were taken along with three gill net sets. In 1955 six one-acre rotenone samples and three gill net samples were collected.

TABLE 3. CADDO LAKE

This table illustrates a comparison of game fish to rough fish in Caddo Lake as averaged from 7 one acre samples collected in 1954.

	Lbs. Acre	Per Cent of Production	Per Cent of Game Fish of Available Size
Game Fish ...	11.74	45.21	48.89
Rough Fish ...	14.23	54.79	
	25.97	100.00	

TABLE 4. BLACK BAYOU LAKE, CADDO PARISH

This table illustrates the comparison of game fish to rough fish in Black Bayou Lake as averaged from five one acre samples collected in the summer of 1954 prior to the construction of the new dam.

	Lbs./Acre	Per Cent of Production	Per Cent of Game Fish of Available Size
Game Fish ...	45.60	75.10	79.80
Rough Fish ...	15.12	24.90	
	60.72	100.00	

TABLE 5. BLACK BAYOU LAKE, CADDO PARISH

This table illustrates the comparison of game fish to rough fish in Black Bayou Lake as averaged from four one acre samples collected in the summer of 1955 after the water level had been raised four feet.

	Lbs./Acre	Per Cent of Production	Per Cent of Game Fish of Available Size
Game Fish ...	12.47	42.82	64.31
Rough Fish ...	16.65	57.18	
	29.12	100.00	

FIGURE 7

Per cent gizzard shad by weight occurring in fish population as determined by fish population samples taken from selected study areas representing the major ecological types of fresh water in Louisiana. The percentage of gizzard shad occurring in the various fish populations sampled are summarized under the various ecological types of water. The horizontal lines represent the range of the per cent gizzard shad for the various types of water. The vertical lines represent the average per cent gizzard shad for the various types of water.

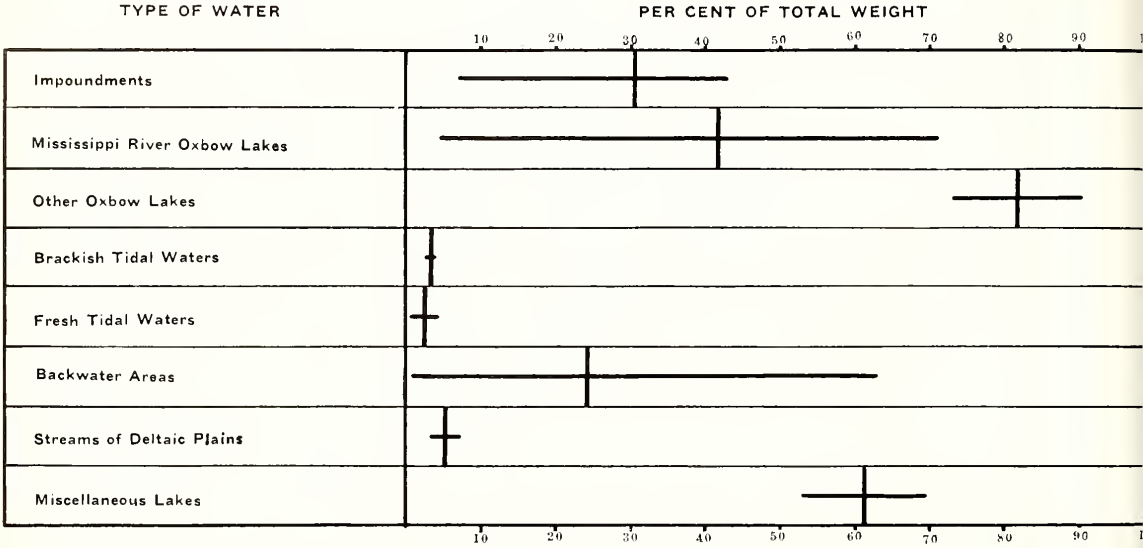


TABLE 6. ANACOCO LAKE

The following table shows a comparison of the rough fish population to that of the game fish population as averaged from three one acre samples collected during the summer of 1955.

	Lbs./Acre	Per Cent of Production	Per Cent of Game Fish of Available Size
Game fish	43.37	70.58	82.85
Rough fish ...	19.08	29.42	
	61.45	100.00	

Fish Population Sampling

Sampling reported under this section is that which has either been done at the request of police juries, local sport groups, or in conjunction with the planning of future studies or jobs planned by this section.

Rotenone samples taken were in the following areas:

Old Bayou Bartholomew, Perryville, Morehouse Parish;
Bayou Pierre, De Soto Parish;
Sulphur Pits, Calcasieu Parish;
Port Sulphur Reservoir, Plaquemines Parish;
Grand Ecaille, Plaquemines Parish;
Old River, Beauregard Parish.

With the exception of Old Bayou Bartholomew, all of these waters were sampled at the request of local organizations desiring to know what the condition of the fish populations were in their respective bodies of water and what steps could be taken to improve the fishing provided by these waters.

During the summer of 1956 requests for additional work of this nature in various waters will be carried out.

Bayou Lafourche Project

This project has been established to study the effects of the pumping of water from the Mississippi River into Bayou Lafourche.

This includes the comparison of the northern section of the bayou which had been completely covered with Alligator Weed and Water Hyacinth prior to the pumping to the same area after pumping had begun. Also to be studied is the effects of the pumping on the fish population, primarily in the central section of the bayou, along with the effects on the water chemistry and plankton.

In the section of the bayou from Larose, Louisiana southward to the Gulf of Mexico, periodically, salinity runs are made to determine if the admittance of this flow of fresh water has any effect on this section of the bayou.

Water Fertility Project

The Water Fertility Project has been initiated to attempt to show if there is any correlation between fish production in ponds per acre and water fertility in terms of phosphates, nitrates, nitrites and plankton in Louisiana waters. The purpose of this being to attempt to establish some type of yardstick as to the productive capabilities of our various types of waters.

There are currently eleven lakes in this project. They are the following:

Lake	Parish	Water Type
Caddo	Caddo	Impoundment
Lake Bistineau	Webster, Bossier	Impoundment
Black Bayou	Bienville, Caddo	Impoundment
Anacoco	Vernon	Impoundment
Chicot	Evangeline	Impoundment
Bayou Pierre	DeSoto	Impoundment
Bayou Bartholomew	Morehouse	Old River Bed
Cane River	Natchitoches	Old River Bed
Providence	East Carroll	Ox Bow (Miss. River)
Concordia	Concordia	Ox Bow (Miss. River)
Clear	Richland	Ox Bow (Boeuf River)

All of these lakes have had fish population samples collected from them.

From each of these lakes during the last week of each month, field water analyses are run and water and plankton samples are collected. The field analyses include turbidity, water and air temperatures, dissolved oxygen, carbondioxide, total alkalinity and pH. The water samples are preserved and sent to the laboratory for analysis for available phosphates, nitrites and nitrates.

The plankton samples represent a 20 gallon sample collected by means of the pump method. These samples are preserved and brought to the New Orleans laboratory and are analyzed according to the Gravimetric method described in Limnological Methods, Paul S. Welch, Pg. 295.

Closeup of fish with tag.

This study project shall be continued through the next biennial.

Rio Grande Tetras

During 1954 numerous bait dealers were shipping into Louisiana large numbers of a fish locally referred to as Mexican Shiners, the correct name being Rio Grande Tetra, *Astyanax faciatus mexicanus*. As this fish possessed a reputation for being a nuisance in its native environment, the Louisiana Wild Life and Fisheries Commission prohibited any additional shipments and either the destruction or removal of any of these fish already within the state.

It became the responsibility of this section to determine if this tropical species was capable of surviving in Louisiana during the winter months.

Numbers of these fish were placed in a pond in the Lacombe Fish Hatchery and in a pond at the Beechwood Fish Hatchery, Forest Hill, Louisiana. Normal appearing tetras were recovered

Seiners at work on fish rescue project.

from the Beechwood Fish Hatchery during March 1955 and during June from the Lacombe Hatchery. These fish were approximately twice the size as when placed in these ponds.

It has been concluded from these two experiments that Rio Grande tetras are capable of withstanding the winters of Central and South Louisiana. Especially since it is known from the observations of the Beechwood Fish Hatchery superintendent that the surface of the pond in which the tetras were placed at Beechwood froze on several occasions and this pond is only approximately 2.5 feet average depth.

This section received reports of tetras from a bait dealer that these fish were present in Red River in the vicinity of Coushatta. However, these reports were not substantiated. At the same time reports were received that a large school of tetras was seen regularly in the southern end of Lake Bistineau and that several were caught on bream hooks while stealing bait from bream fishermen. One of these fish which had been caught on a hook was preserved and turned over to this section. No reports of this fish being observed in any waters has been received during 1955.

The Farm Pond Program

Max W. Summers, Project Leader

Because of interest expressed by people all over the state, the Louisiana Wild Life and Fisheries Commission initiated a farm fish pond management project. This project is aimed at furnishing technical advice on pond mangement and evaluations of stocking rations, fertilization problems, weed control and controlled fishing experiments.

Through these studies and experimental problems a plan can be designed to make farm fish ponds a source of good fishing for many years. Fish ponds differ from one section of the state to the other. In order to manage them effectively it is necessary to learn the biology of the pond to be managed. The pond management program is geared to take care of individual ponds plus experimental work to discover a basic management plan suitable for the entire state.

The value of the farm pond is extremely diversified. The presence of a good pond will add greatly to the balance of any farm. If handled properly, the pond can provide a source of recreation for the entire family, water for livestock or irrigation purposes, and fish for the table. However, a pond must be managed extensively for fish production. The average pond will support from 100 to 200 pounds of fish per acre. If fertilized, the production can be increased from 300 to 400 pounds of catchable size fish per year. This is only one phase of pond management. There are many other phases in which we are particularly interested, such as: correct stocking ratio; proper species to stock; weed control measures, and actual fish harvest methods.

The pond management project has been in effect for the past year. During that period most of the time was devoted to extension work. Representatives of the Louisiana Wild Life and Fisheries Commission would visit the pond owner, sample the pond, survey the possibilities of fish management and draw up suitable management plans. This preliminary work was essential to the over all problem of effective fish pond management. We have now reached the point where actual pond management may be used. There were more than 30 ponds to receive fish for stocking. These ponds will be managed by plans drawn up by the fisheries biologists.

Since the project began, over 100 ponds have been checked by fisheries biologists. The management plans have been drawn and discussed with the pond owners. We now have well over 100 applications and letters from people wishing help and assistance with their fish ponds. Now tech-

Taking fish sample via the rotenone method in Bayou DeSiard, Monroe.

nical assistance and advice is available for persons desiring help with fish pond management.

In conjunction with the actual pond management, various stocking ratios will be used to determine the most effective ratio to use in Louisiana. Also fertilizer evaluations will be carried out in order to determine the most economical and most efficient fertilizer to use in weed control and fish pond production.

This project, though just begun, has many details to uncover and many biological facts to reveal. Its termination will depend on the length of time it takes to gather enough valid information to use as a dependable guide to fish pond management in Louisiana.

Fish Hatcheries

Max W. Summers, Hatchery Biologist

The Louisiana Wild Life and Fisheries Commission maintains and operates three state fish hatcheries. These hatcheries are located at Monroe, Forest Hill and Lacombe, Louisiana.

The Beechwood Hatchery at Forest Hill and the Huey P. Long Hatchery at Lacombe are producing fish at the present time. The Monroe Hatchery is now inactive while it is being remodeled and enlarged. We hope to have it back into production for the spring spawning of 1956. These hatcheries are manned and operated by personnel of the Wild Life and Fisheries Commission. Each hatchery has a manager. He is responsible for the operation, maintenance and appearance of that hatchery. There is someone on duty all the time to see that the hatchery is functioning properly. Our hatcheries are open to the public and we encourage public inspection. By this we hope to point out the part our fish hatcheries play in the overall scheme of fisheries management.

The hatcheries are so located that fish distribution over the entire state is no problem. The present location of our three hatcheries makes possible the rearing of fish near the areas to be stocked. This arrangement eliminates long transport routes, thereby cutting down fish mortality and decreasing the overall cost of fish production.

The species of fish propagated in our hatcheries are largemouth black bass (Micropterus salmoides) and bluegill sunfish (Lepomis machrocirus). These species of fish have proved to the most desirable species of warm water fish that we are able to raise effectively in our hatcheries.

The bass spawn when the water reaches a temperature of 75° F. This usually occurs in March or April. The adult bass care for the young until they reach 1 to 1½ inches in length. Then the small bass swim from the nest in schools. They remain in these schools for as long as two weeks. The bass are a predaceous fish and the adults often feed on their own offspring. For this reason we remove the adult bass soon after spawning. Sometimes we remove the schools of small bass fry and place them in other rearing ponds where they will be safe from predation by the adult fish. We use these techniques of hatchery management to insure a large fish population and a large fish production for our hatcheries. The bass fry are reared until they reach 2 or 3 inches in length, then the fingerlings, as they are now called, are ready for stocking. The hatchery ponds are drained and the fingerling bass removed.

The fingerling are placed in a fish transport tank supplied with oxygen and hauled to the various areas where they will be stocked. When this operation is completed, the hatchery ponds are refilled with water. Then the brood bluegill are paired and placed in these ponds. The bluegill spawn from May through October. They differ from the bass in their food habits. They are not predaceous in nature and the adults may be left with the small fry until the ponds are drained and the small fish removed. Bluegills grow fast and the fry soon reach fingerling size. At this size they are ready to be stocked. The distribution of bluegill begins in the late fall or winter. The same method of removal and stocking is used with the bluegill as it was with the bass. Again the ponds are refilled with water and the brood bass placed in them. So you can see this is a complete cycle of events in the operation of a fish hatchery. By staggering our delivery dates and calculating the spawning time of our fish, we can grow two crops of fish per year. This is another idea in hatchery management and it pays off in more fish, less effort, and less expense. The goal in hatchery management is large production at the lowest possible cost.

We plan to begin experiments, using white crappie (*Pomoxis annularis*) and channel catfish (*Ictaluris punctatus*) in our hatchery program. We propose, if we can raise these two species of fish in large numbers, to use them in our overall stocking program. They will, if the experiment proves satisfactory, be stocked in the large impoundments and bodies of water throughout the state. This experiment will be conducted next year at our Beechwood Hatchery.

Before and after pumping operation on Bayou Lafourche at north end in Donaldsonville. Note Mississippi River levee in the background.

Fish for Restocking

To procure fish for stocking write the Louisiana Wild Life and Fisheries Commission, 126 Civil Courts Building, New Orleans 16, Louisiana. You will be mailed a fish application blank. Fill out this blank with the required information and mail it back to the above address. A fisheries biologist will then inspect your pond or lake to determine if it will be suitable for fish production. If the pond is to be stocked, a suitable fish management plan will be drawn up and outlined by the biologist. You will be notified when you are to receive fish. There is no charge for the fish and assistance. They are rendered as a public service by the Louisiana Wild Life and Fisheries Commission.

During the past two years our hatcheries produced over 150,000 fish, of which 100,000 were bass, both fingerlings and adults and 50,000 were adult and fingerling bluegill. The Beechwood Hatchery produced over 60,000 adult and fingerling bass. Also over 32,000 bluegill were reared at Beechwood. These fish were stocked in farm ponds and other impoundments over the state.

There is another crop of bluegill now in the Beechwood Hatchery. They will be delivered to farm ponds in conjunction to the new farm pond program set up by the Commission.

The Lacombe Hatchery produced over 15,000 bluegill and bass. These fish were distributed to various locations throughout the state. There is one pond at Lacombe which has been stocked with a bass and bluegill combination and opened to fishing by children under 16 years of age. This is an experiment to ascertain the effect of heavy fishing. Since the pond was opened over 250 pounds of bluegill have been harvested. Also this pond has yielded almost 100 pounds of bass. This program has been under way almost a year. So far the pond has yielded 350 pounds of fish. That is about 175 pounds of fish per acre. Because of Aphanocapsa sp. growth on the ponds at Lacombe we lost several thousand small bluegill that were not included in the hatcheries production report. The small fish were entangled in this algae and died when the pond was being drained. This algae is being sprayed by the personnel of the noxious weed project.

The Monroe Hatchery produced over 20,000 bass during the period this report covers. These bass were both adult and fingerling stock; they were released in Clear Lake, Bayou DeSiard, Phillips Lake and farm ponds near Monroe.

The production of the hatcheries was sufficient enough to take care of numerous stocking efforts. We will now step up our production in order to fill the orders which have been received since the last fish delivery dates. Also our hatchery program is being enlarged to incorporate it into the various fisheries improvement and management projects being carried on throughout the state.

Noxious Weed Control

Willis Hardcastle, Project Leader

The climate of the state favors a lush growth of vegetation, the long growing season with long sunny days is a boon to the agriculturist in producing food and fiber crops, but these same climatic conditions favor the growth of weed species which infest fields, lakes, streams and marshes alike.

The lakes, streams, and marshes of the state have become infested with native and introduced weed species to the extent that they are responsible for a drastic decrease in the production and harvest of game and commercial food fish.

Weeds reduce the production of fish food by competing with the food plants for necessary light and mineral nutrients, they also provide cover and protection for the small fish which normally serve as food for the larger and more desirable fish species. Weeds also compete directly with fish for the available oxygen in the water, and particularly during periods when great masses of vegetation are decaying, weeds may be responsible for drastic reductions in the fish population.

Weeds in specialized areas such as hatchery ponds develop to such an extent that, at times, they seriously hamper the proper management of the hatchery ponds and make the production of fish for restocking activities a very difficult operation.

In the past, many methods, such as cutting, dredging and poisoning have been used with no great degree of success in an attempt to bring these aquatic weeds under control. The development of new herbicides hold promise of providing a means of bringing these noxious water weeds under control and points to the possibility of their eradication in certain localized areas. The progress on the control of the very troublesome water hyacinth (*Eichhornia crassipes*) by the use of one of these herbicides, 2,4-D (a salt of 2,4-dichlorophenoxyacetic acid) a "hormone" type herbicide is discussed elsewhere in this report.

The Noxious Weed Research Project has been established to determine the most effective and economical way to control weeds, both broad leaves and grasse, in aquatic habitats throughout the state.

Toward this end, a laboratory has been set up in Baton Rouge to study various commercially available herbicides and the newer chemicals which are still in the developmental state to determine their adaptability to use in controlling aquatic weeds.

Here such factors as type and rate of application of the herbicides are tested on various noxious weed species, and properties such as movement in water and effective concentration of the test materials are investigated. Toxicity to animal life and plant life in and adjacent to the weed infestations are also considered.

Herbicides which have shown promise in the laboratory screening are tested in outfield sites at various locations throughout the state to determine their adaptability to local conditions.

A continuing liaison is maintained with the Hyacinth Control Project to make immediately available the findings of the Noxious Weed Research Project to the units in the field, and to render any possible assistance toward the furtherance of the aims of that project.

Periodic field surveys are made to examine new areas of infestation by water weeds and recommendations for their control are promulgated.

Surveys are also made of treated areas to evaluate the effectiveness of control measures and to determine the types of plants which are replacing the weeds which have been removed, toward the end of preventing the reinfestation by the same noxious weed type or another type which could become a serious pest.

During the past biennium tests conducted with a number of aquatic weeds by the Noxious Weed Research Project have resulted in the development of adequate control measures for certain weed species as listed below, for others, among them the very troublesome Alligator grass (*Alternanthera philoxeroides*), no effective control practices have as yet been developed. Experimentation is continuing on these more difficult plants; it includes the testing of different methods of application and the testing of new chemicals, still in the developmental stage which have been made available to the project by the Research and Development divisions of several of the formulators and manufacturers of herbicides.

CHEMICAL CONTROL MEASURES FOR AQUATIC WEEDS

Name	Control[1]
Pickerel Weed (**Pontederia** sp.)	Use 2,4-D[2]
Naiad (**Najas** sp.)	Use Risin D Amine
Willow Primrose (**Jussiaea diffusa**)	Use 2,4-D[2]
Algae (**Spirogyra** sp.)	Use Rosin D Amine
Algae (**Anabaena** sp.)	Use Copper Sulphate
Algae (**Pandorina** sp.)	Use Copper Sulphate
Cabomba (**Cabomba caroliniana**)	Use Rosin D Amine
Hornwort (**Ceratophyllum demersum**)	Use Rosin D Amine
Southern Wild Rive (**Zizaniopsis** sp.)	Use Sodium Trichloroacetate[3]
Banana Water Lily (**Castalia flava**)	Use 2,4-D[2] [3]

[1] Sprayed areas should be kept under close observation; seedlings may sprout in the treated area which would necessitate retreatment.

[2] The addition of a household detergent such as "All" materially enhances the activity of 2,4-D on waxy leaf aquatics.

[3] Aerial parts only affected.

Dingell-Johnson Project F-4-R

Fish Population and Aquatic Conditions In Polluted Waters

Frank Fairchild, Leader

The problem of pollution in Louisiana, while under excellent control and subject to stringent laws, is still far from solved. There is still much work to be done toward determining the exact relationship between polluted waters and fish production, fish utilization and fishing success. These answers are needed in order to establish an index of pollution which will reflect its actual effect on aquatic conditions. The problems of potential pollution, as a result of industrial growth, increases daily. If the present beneficial uses of the waters of the state are to be preserved in the face of ever-growing industrialization, it is of paramount importance that accurate, reliable data be available relative to the effect of industrial and domestic waste discharge upon aquatic life of the receiving waters.

Being cognizant of these needs and demands, the Wild Life and Fisheries Commission set up Dingell-Johnson Project F-4-R (initiated in July 1954) in order to gather information relative to general aquatic conditions in polluted waters. Data obtained from this research program should be of value in giving some of the answers needed for evaluating the amount of pollution compatible with good fish management.

The Ouachita River (including certain tributaries and adjoining lakes) has been selected for this study, this selection being made primarily for two reasons. The waters are of general importance from the standpoint of studying sport and commercial fish species, and are, in part, subjected to various types of waste discharges which are, in themselves of general importance.

In the past the Ouachita River system has supported a considerable amount of sport fishing; in certain areas it still does to a great extent. Similarly, commercial fishing has been of considerable importance in contributing to the general economy, but is reported to have progressively declined in the last decade. Wastes of particular importance which are shunted into the Ouachita or certain of its tributaries, and which may act as pollutants at various times of the year, are several in number. Those of greatest importance are from paper mills, oil and gas fields, and chemicals from chemical manufacturers. Accidental loss of materials from the latter source were the cause of many tons of fish being destroyed in the Ouachita shortly after initiation of this project. Another pollutant of dubious character is domestic sewage discharge.

In order to attain the ultimate broad objectives of the project, work has been categorized under separate jobs, each with its own objectives. A discussion of the various segments, their objectives, and accomplishments thus far are presented below.

Fish Population Study

Inasmuch as the end products of aquatic production are fish, it is of prime importance to determine relationship between pollutional effects and fish population composition. Other objectives of this particular phase are: to obtain information concerning the game fish—commercial fish ratios, and; to determine the effects of pollution on fish distribution. The majority of sampling conducted thus far has been by use of wire traps, hoop nets, and seines. In addition, some fish sampling has been by means of a chemical which causes the fish trapped within a sample area to rise to the surface and die of asphyxiation. This last method lends itself very readily to sampling certain types of waters, at certain times of the year. Since each type of sampling is, to some extent, selective for various species of fish, it is necessary to gather information by as many methods as possible in order that a true picture of species composition be obtained. Sampling methods are standardized as much as possible so that data from various areas may be compared and a quantitative analysis of results may be obtained. In this manner, it is possible to compare fish catch in polluted waters with those in waters of little or no pollution.

These methods have already yielded information which indicate the species composition of the Ouachita during various times of the year for certain areas of pollution. In addition. these sampling methods have given information relative to ratios of game fish—commercial fish—trash fish for the various areas of the Ouachita system. Since fish population sampling was just begun in late February, 1955, there has not been enough data collected to present conclusive findings. It is pointed out that fish sampling data being collected will not only be useful in reaching the objectives given above, but will also give pertinent biological information which can be utilized in attainment of the objectives of other study phases of the project. For example: By use of standardized methods in trapping and hoop netting it has been possible to gather information concerning movements of tagged fish; collection of data on lengths and weights of representative samples of fish catch will give information relative to size and age groups inhabiting various waters, and; fish stomach analysis will give some insight as to food habits, which in turn can be compared with findings on abundance or absence of fish food organisms collected by botton sampling in polluted and non-polluted area.

Size and Age Group Studies

The ultimate goal of this job is to obtain information concerning the predominant age and size groups of some of the important game fish species in polluted waters. Preliminary work has consisted of recording length and weight measurements of all fish taken in traps, hoop nets, and seine hauls. These data, collected over several years, will give information on the normal composition of size and age of fish in the various waters sampled. Also, recovery of tagged fish may possibly give information as to growth of fish, inasmuch as lengths and weights are taken prior to release of these individuals. It is doubtful, however, that growth studies, as related to pollutional effects, will prove of any significance since there is no way of knowing how long the fish have been in polluted waters prior to being collected. Therefore, most emphasis is being placed upon determination of size groups and their distribution. Age determinations will mainly consist of comparison of length-weight data with that collected on Dingell-Johnson project F-1-R which has facilities and man-power to conduct a very comprehensive study of age and growth of fishes from various water bodies throughout the state.

Fish Food Studies

The objectives of this segment are: to obtain information concerning the composition of fish food organisms (insects, worms, shell forms, etc.) in the polluted and non-polluted areas of the Ouachita system, and; to determine whether the presence or absence of food organisms is integrated with fish population composition. These objectives are being accomplished by collecting samples of food materials from the bottom and bank soils of the areas selected for study. Stations are set up in non-polluted areas, areas of heaviest pollution, and in zones of intermediate pollution. These stations are located at or in the vicinity of fish sampling stations. Samples are taken periodically throughout the year at each station. In this manner it is possible to determine the abundance or absence of food materials available to the fish. It is known that certain types of food organisms have preference as to types of waters they live in. A variety of types of fish food organisms will indicate that the waters are not polluted and therefore should be a good habitat for a variety of fish species. On the other hand, in waters of heavy pollution there will be found only one or two types of food organisms, but these will usually be in great numbers. Therefore, it is seen that a study of the food organisms will not only be extremely useful in delineating boundaries of pollution, but will also indicate the suitability of the area as a habitat for fish. Since the initiation of the project, samples have been collected about every 60 days from approximately 25 stations. Good results have been obtained from bottom sampling data; not only has it verified known pollution, but has also pointed a finger to areas where pollution was just suspected. This project phase, like others included herein, must be systematically pursued over a period of several years before a definite trend can be established and the findings attributed to the appropriate causative agents, whether they be man-made, wholly or in part, or due to natural conditions which are often associated with occurrences such as rainfall, water levels, flushing action, currents, leaching of nutrient materials, etc.

Food Habit Study

The principal objectives of this job are: To determine the predominant food habits of fish collected in selected waters, and; to attempt a correlation between the food organisms utilized by fish and the presence or absence of these organisms, as determined by bottom sampling. Data for this study are being collected at periodic intervals throughout the year—usually when fish sampling is being conducted. Representative fish samples of a catch are weighed and measured, and the stomach of each is preserved separately for subsequent examination in the laboratory. In this manner it is possible to determine the predominant types of food organisms being eaten by each species of fish; this in turn is compared with results obtained from collection of the bottom fauna in those areas of heavy, moderate and non-pollution. This type of data will prove of value in determining availability and utilization of fish foods and the effects of pollution upon them. Stomach analyses were not begun until late spring of 1955, but some information has already been gleaned from this phase of investigation.

For example, it is known, for the period sampled, that catfish feed almost exclusively on small shell forms (mostly clams) in the areas sampled, and that the heaviest concentration of these food materials are found in non-polluted waters. Similarly, stomach analyses of black crappie, white crappie, bluegill and other game species (excluding bass) mostly yielded blood worms (young stages of the midge fly) for the period sampled. These forms are found to some extent in both polluted and non-polluted waters, but, in the Ouachita system, greatest numbers occur in relatively clean waters. Study of the food habits of fish, then, can materially assist in determining the relationship between pollution and fish management.

Reproduction Study

In order to study the long range effects of pollution on the fisheries potential, it would be of some consequence if information could be obtained concerning the success of natural reproduction of fishes in waters subjected to pollutional materials. However, there is more than meets the eye in a study of this type, inasmuch as many problems are involved and successful accomplishment is somewhat doubtful. For example, there is no assurance that fish collected for this study have been in polluted waters long enough to give any indication that reproductive processes might be altered—in which case they could not be typical. At any rate, however, some work of this nature is deemed advisable if only to determine the feasibility of the plan. Study areas selected have essentially included those same general areas where other data are collected. In order to test for reproductive success it is necessary to collect samples of the young of the year fish, to examine the reproductive organs of adult fish, and to collect accurate data on ratios of young and adults during routine population sampling.

Fish Migration and Movement Study

This segment has been designed in an attempt to study the effects of pollution on spawning areas of migratory fish, and to determine whether pollutants will act as a barrier by preventing fish from moving through them to a more suitable habitat. It is entirely possible that polluted areas can act as a barrier and inhibit or restrict fish movement, either up or downstream. Even more important is the possibility that spawning grounds are rendered unsuitable. A study of this nature is necessarily limited to waters where clear-cut cases of pollution exist. During certain months of the year, the Ouachita river (specific localities) has chemical and physical characteristics which are very unfavorably disposed to what is ordinarily thought of as a good environment for fish. These areas must be checked, not only with studies as previously outlined, but also to ascertain whether the polluted conditions act as barriers to fish movement.

Various methods will be used in order to catch fish which are tagged and released in areas below, in, and above pollution. A trapping and tagging phase of this study has been initiated and with good success. Tag recoveries have been made, both by response of sport and commercial fishermen and by our own trapping and hoop netting. Recovery of tagged fish has already shown that areas of severest pollution do not act as a barrier to fish movement during periods of high water, which of course causes considerable dilution of the pollutants. However, this gives no indication of pollutional effects in summer months when water levels and ensuing dilution are at a minimum. In addition, tag recoveries have given us information of general biological importance relative to our long-range fisheries program. From this, we hope to learn something more concerning fish dynamics within a river system of our own state.

Chemical Studies

It is generally recognized that chemical data are not in themselves sufficient to determine the effects of pollutants upon the receiving waters, nor are they to be used as the only source of information for intelligent pollution abatement. They are, however, important for purposes of evaluating the extent and degree of pollution on a quantitative basis. Thus, this segment has been set up to determine the effects of various pollutants on physical and chemical characteristics of the waters of the Ouachita system, and to attempt to correlate the presence of fish food organisms and fish with the chemical data obtained.

Dingell-Johnson Project F-5-R

Evaluation of Commercial Gear

Jim Davis, Project Leader

Commercial fishing occupies a very real place in the economy of many people in this state. Sport fishing also occupies a high place in the thinking of many people. This is evidenced by the hordes of fishermen that can be found on any stream bank during the spring months.

In an effort to compromise the often conflicting desires of these two groups the fisheries section set up a project to determine the most efficient type of net for taking commercial fish. At the same time an investigation will be made to determine the type and mesh size of nets that will have the least destructive effect to the game fish populations in an area.

From these investigations it is hoped that sufficient information will be obtained to put the regulation of the freshwater commercial fishing industry on a sound research basis. To accomplish this end this project must be a continuing one. The number of fish in an area may change, allowing the easing of regulations. This will require that a constant check be kept on the commercial fishery in the state. This fact has already been provided for by the fisheries section.

This project was started late in 1955. Therefore, little information has been gathered at this time. In the next few months it is hoped that sufficient personnel and equipment will be available to start work in earnest on the project.

Fish Parasite Studies

Dr. Harry Bennett, Leader
Louisiana State University

No heavily parasitized fishes have been encountered thus far but one or more kinds of parasites were found in 96 per cent of the game and in 87 per cent of the rough fishes. An insufficient number of fishes have been examined to establish that any one kind of parasite is more abundant than another but the data accumulated indicate that larval trematodes, cestodes and nematodes are more prevalent in the game than in the rough fishes. Many fishes examined in the colder months of the year were completely free, or nearly so, of parasites but the latter are becoming more abundant with the approach of warmer weather. Data on intensity were recorded but are not presented in this report.

Project F-1-R
Fish Population Investigation
Dingell-Johnson

Victor W. Lambou, Leader

Introduction

On April 1, 1953, Dingell-Johnson Project F-1-R (Fish Population Investigation) was initiated in order to gather the basic information needed to plan a constructive sport fish management program. The Fifth Biennial Report covered the progress of the project from April 1, 1953 through December 31, 1953, and presented a review of the objectives of the project.

During the biennium, the project was expanded to include additional activities beside those originally described. Considerable progress has been made during the biennium in realizing the project's objectives. The results of the work accomplished, especially the results of the fish population samples, are much too complex to be given in its entirety in this biennial. Therefore, only a brief summary is presented. A summary of the work done to date follows.

Fish Population Sampling

The objectives of this phase of the project is to gather information regarding fish populations occurring in selected study areas representing the major ecological types of freshwater in Louisiana and to determine the status of game fishes, ratio of game fishes to non-game species and standing crops of fish. This information is one of the basic essentials needed to formulate an intelligent fish management program. The principal sampling technique being used by the project is the technique by which all fish are poisoned and recovered from representative areas within a body of water. Other sampling methods such as those which employ the use of seines, trawls, traps, trammel nets, gill nets and fyke nets are also used.

Figure 1 presents a summary of the standing crops of fish occurring in some of the major ecological types of water. The occurrence of game fishes, available game fishes, bass, crappie, sunfish, and gizzard shad in the various fish populations sampled is presented in Figures 2 through 7. The data on fish populations summarized in this report represents only a preliminary evaluation of the status of fish populations in Louisiana. Additional samples will be taken during the next biennium. The field work on this phase of the project will be concluded during the summer of 1956 and a final report will be prepared at that time. Of particular interest is that some fish populations were composed primarily of gizzard shad (Figure 7). Gizzard shad when over abundant can be detrimental to game fish populations. (See pages 47 to 52.)

Reproduction Study

The objective of this phase of the project is to determine the success of natural reproduction of fishes in waters selected for study. Twenty bodies of water were sampled with minnow seines and/or with trawls to determine the abundance of small fishes.

Small game fishes occurred in the samples taken from all bodies of water. If this indicates that natural reproduction for these fishes has taken place, game fishes are reproducing themselves successfully in all bodies of water selected for study. The bodies of water selected for study are believed to be representative of the bodies of water occurring in the state which are utilized for sport fishing.

In the past the Louisiana Wild Life and Fisheries Commission has carried out a program of stocking public fishing water with warm water game fishes obtained from hatcheries and from overflow pools and lakes. If freshwater game fishes are reproducing themselves successfully in these waters, the stocking of such waters is of little value. Considering the fecundity of warm water game fishes, it is probable that a very small per cent of what would be hatched naturally would be added to a body of water and this would have little or no effect upon the fish population. In some cases adult game fishes were used for stocking. Likewise, at the rate such stocking has taken place, it is probable that the fishes added to a body of water would be but a very small per cent of the number of adult fishes already present. Considering the fecundity of game fishes, the addition of a relatively small number of possible brood stock should have little or no effect upon the establishment of future year classes. The abundance, survival, and growth rates of the various year classes of the different fishes present in a body of water, which are probably controlled by complex ecological relationships, are probably the determining factors in the make-up of the fish population.

Largemouth bass and bluegill sunfish were the most abundant game fishes in most of the samples. Kentucky bass, white crappie, black crappie, redear sunfish, longear sunfish, stumpknocker sunfish and yellow bass were present in many of the samples. In all cases game fishes which are usually classified as predaceous game fishes (largemouth bass, Kentucky bass, white crappie and black crappie) and game fishes which are usually classified as forage game fishes (various sunfishes) occurred in the

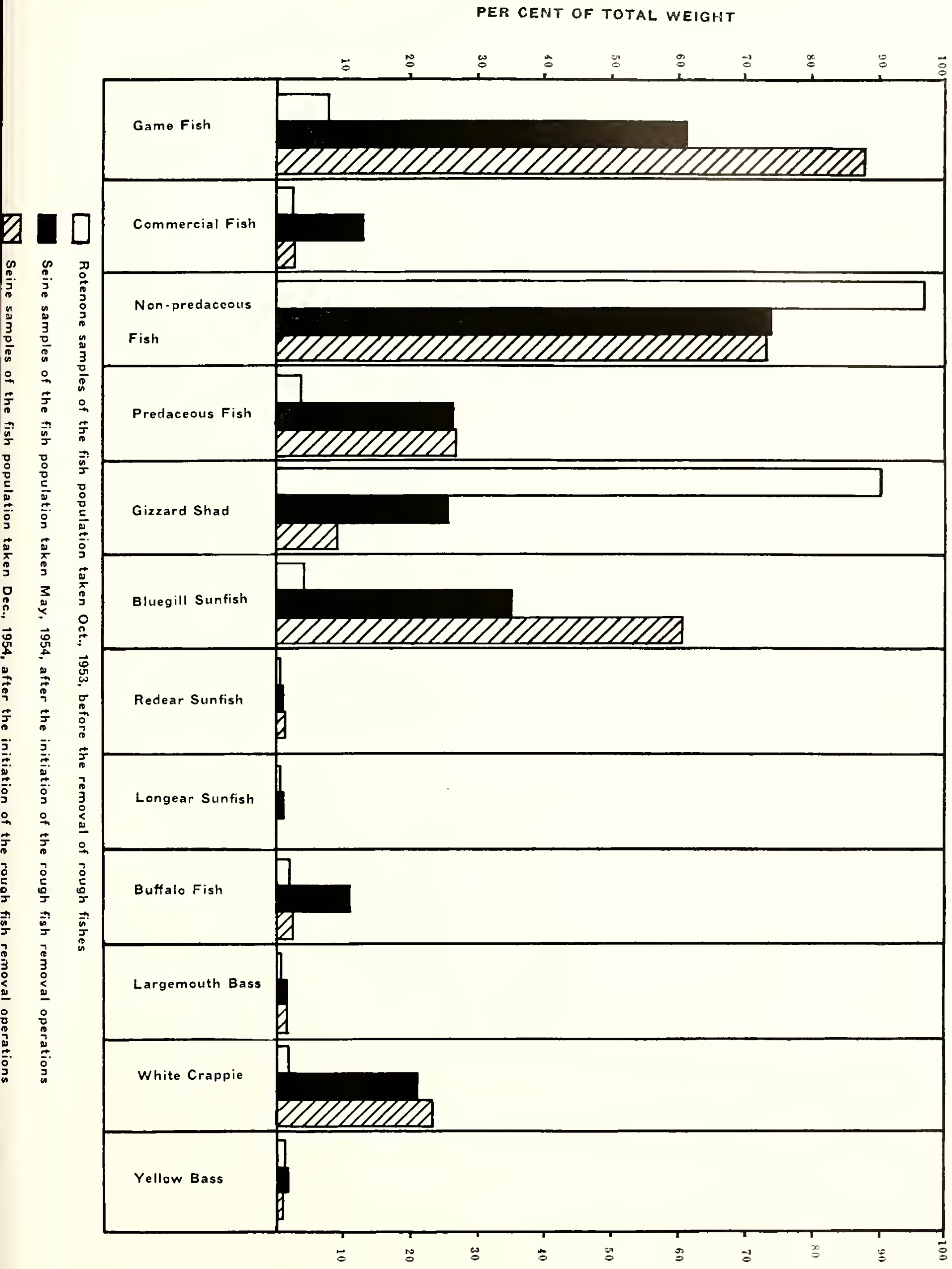


FIGURE 8

Composition of the fish population in Clear Lake before and after removal of rough fishes.

FIGURE 9

Number of fish caught per man hour of effort on Clear Lake before and after removal of rough fishes.

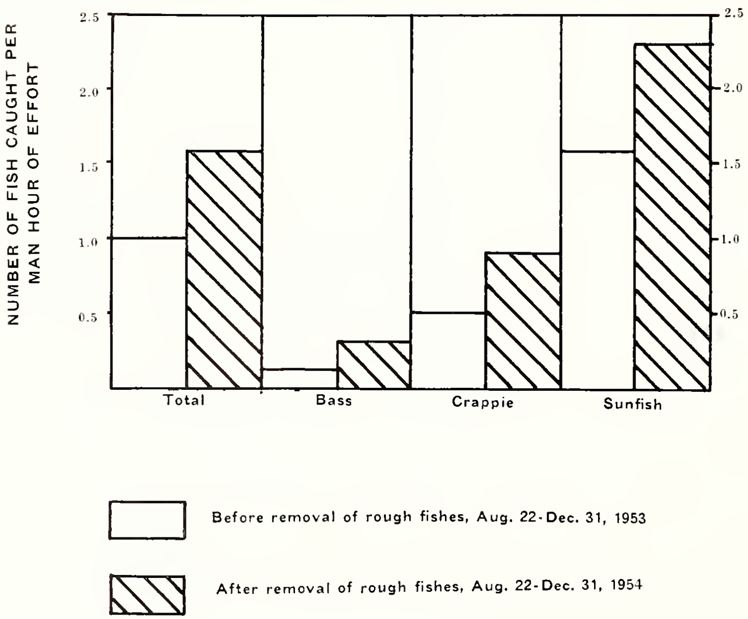


FIGURE 10

Pounds of fish caught per man hour of effort on Clear Lake before and after removal of rough fishes.

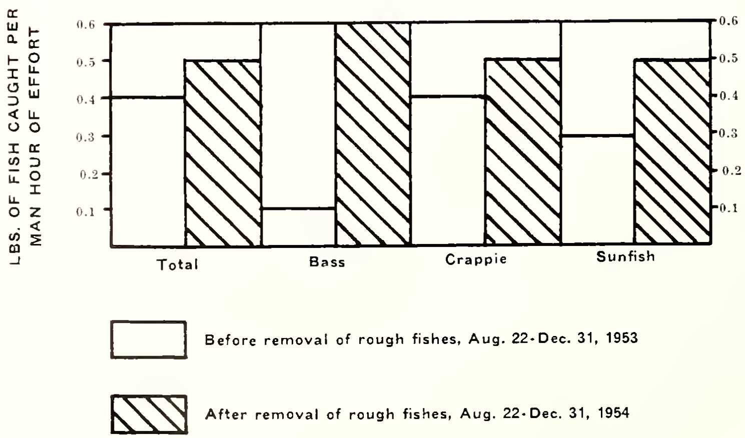
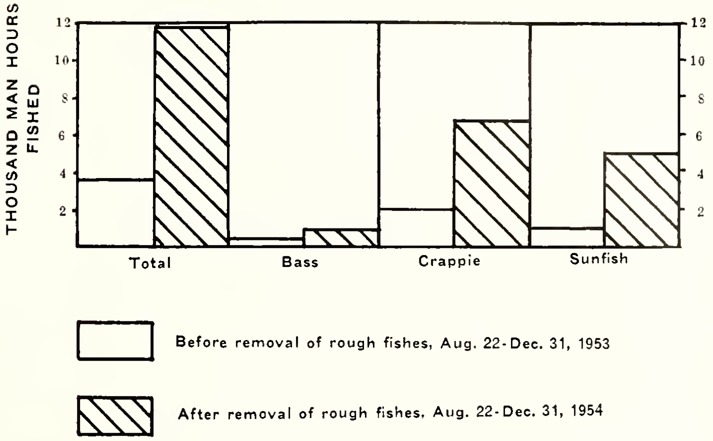


FIGURE 11

Number of man hours fished on Clear Lake before and after removal of rough fishes.



samples. Such a combination is usually thought of as ideal for warm water sport fisheries.

Examination of Gonads of Fish

The objectives of this phase of the project are to determine the spawning season and the maturity age and size of the most important species of fish. Gonads of adult fishes were examined whenever specimens were available. The condition of the gonad was placed in one of the following categories: (1) Immature, (2) No Development, (3) Developing, (4) Ripe, and (5) Spent. A tabulation of the data collected so far could serve no useful purpose in this report. This phase of the project is being continued and the data already collected and that to be collected will furnish the information needed to meet the objectives.

Age and Growth Studies

The objective of this phase of the project is to determine if the scale method of aging fish can be used to determine the age and growth of game fishes in Louisiana. A knowledge of the age and growth of fishes is helpful in regulating fishing limits and in evaluating various management practices. Preliminary work done has shown that in some fishes and in some sections of the state the scale method of aging fish is valid. More emphasis will be placed on this phase of the project during the next biennium.

Determination of Growth Rate

The objective of this phase of the project is to determine the rate of growth of young of the year largemouth bass, white crappie, and black crappie. The growth rate of these fishes will be determined by the length-frequency method. Young fishes were collected from (1) Bayou De Siard, (2) Larto Lake, (3) Lake Bistineau, (4) Lake Providence, and (5) Clear Lake, during the spring, summer and fall of 1955. The work on this phase will be concluded during the winter of 1955-56.

Clear Lake Fish Population

Clear Lake, which is a small oxbow lake in Richland Parish, was selected as a study area in order to gather information on how to manage this lake and other similar bodies of water for sport fishing.

Fish population samples taken from Clear Lake showed that the lake was overpopulated with rough fishes. Approximately 90 per cent by weight of the fish population consisted of gizzard shad. Rough fishes were removed from the lake by seining in order to determine if the fish population composition of the lake could be changed to one which is more favorable from a sport fish management standpoint.

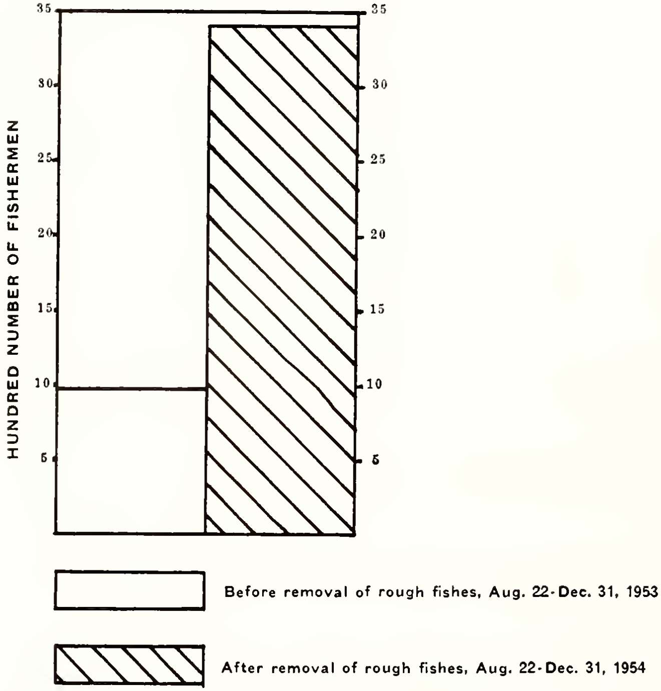
Table 1 shows the amount of rough fishes removed from the lake. Over 200 pounds of rough fishes per acre were removed from the lake, and as expected this had a considerable effect on the fish population composition in the lake. Figure 8 illustrates the changes which took place in the fish population. In order to determine what effects this removal of rough fishes would have on the sport fish catch a creel census was initiated on August 23, 1953, and which at the present is being continued. The sport fish catch of a 132 day period (August 22-December 31, 1953) before the removal of rough fishes is compared to the sport fish catch of a 132 day period (August 22-December 31, 1954) after the rough fish removal operations were initiated. This comparison is illustrated in Figures 9 through 14.

The effects of the removal of rough fishes on the sport fish catch can be summarized as follows:

1. The removal of rough fishes increased the average catch of the fishermen.
2. Due to an increase in the average catch of sport fish, the sport fishing pressure increased during 1954.
3. Due to an increase in the number and pounds of fish caught per man hour of effort and an increase

FIGURE 12

Number of fishermen fishing on Clear Lake before and after removal of rough fishes.



in the sport fishing pressure, the number and pounds of fish harvested from Clear Lake was substantially larger in 1954 than in 1953.

In order to determine the effect of the rough fish removal operations upon the reproduction of game fishes, small fishes were sampled with minnow seines and trawls. Small white crappie were numerous in the lake during the spring of 1954; however, during the spring of 1955 they were almost completely absent. Small largemouth bass were fairly numerous during the spring of 1954 but they were extremely numerous during the spring of 1955.

Clear Lake Tagging Study

In order to determine the rate of harvest of game fishes by sport fishing, tagged fishes were released in Clear Lake. A streamer type tag was used and a reward was given to all sport fishermen returning tags. Table 2 summarized the results of the tagging study. It can readily be seen that sport fishermen are harvesting but a small per cent of the available supply of sport fishes.

Experimental Stocking

A fair number of buffalo fishes were removed from Clear Lake during the rough fish removal operations carried out previously on the lake. If all these fish would have been sold, the money received would have paid for a substantial portion of the operation. There is no evidence and the writer does not believe that buffalo fishes have or will spawn successfully in the lake. If this is true, the number of buffalo fishes in the lake can be controlled by a controlled stocking of young buffalo fishes. It is theorized that if only a very limited number of buffalo fishes are in the lake, they will fill an ecological niche and will have little or no detrimental effects on the game fish population.

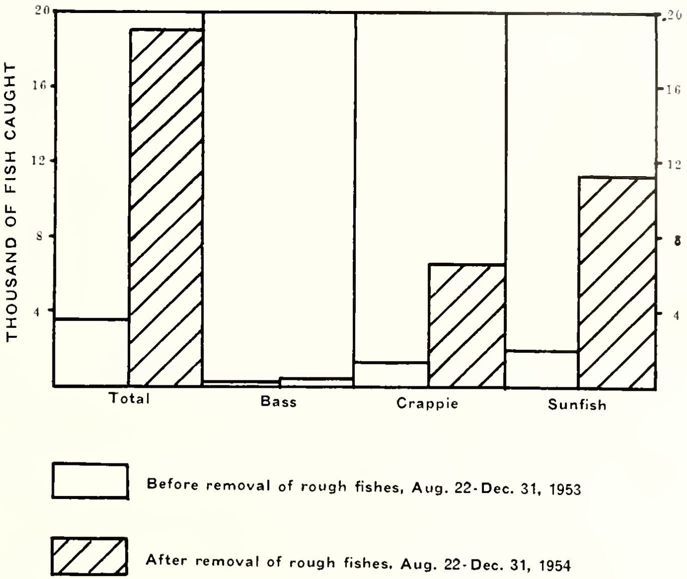
In order to test the above theory, 265 small buffalo fishes were stocked in Clear Lake during the winter of 1955. It is hoped, that if it is again found necessary to remove rough fishes from Clear Lake, that the buffalo fishes stocked will helped finance the operation. It is also possible that rough fish removal operations carried out at intervals of several years, could be financed fully or partly by the sale of buffalo fishes captured in the lake and would prevent the lake from becoming overpopulated with rough fishes. Fish population samples to be taken from Clear Lake over a period of years will be analyzed in order to determine what effect the stocking of buffalo fishes has on the game fish population.

Lake Bistineau Investigations

A management and research plan for Lake Bistineau calls for the fluctuations of the water level in the lake in order to improve the waterfowl hunting and sport

FIGURE 13

Number of fish caught from Clear Lake before and after removal of rough fishes.



fishing. In order to determine exactly what effect the fluctuation of the water level in the lake will have on the fisheries of the lake and to gather information needed to plan a constructive sport fish management program for artificial impoundments occurring in Louisiana, the project initiated a detailed research program on Lake Bistineau. The research being done includes fish population studies, creel census studies, fish tagging studies, fish food studies, studies on the age and growth of fishes and fish reproduction studies. In as that this phase of project work was only recently initiated, work done to date does not justify a detailed discussion.

River Basin Studies

The Louisiana Wild Life and Fisheries Commission had received reports that other government agencies were planning certain engineering projects for the Larto and Marksville Backwater Area and that these projects would be detrimental to the wildlife and fisheries resources in these areas. Because of this a survey was made of the sport and commercial fisheries of these areas.

The Larto and Marksville Backwater Area is located in the vicinity of where Red River flows into the Atchafalaya River. The Larto Backwater Area is located on the north and east side of the Red River, and includes the Backwater Area in the vicinity of Larto Lake and the town of Larto, Louisiana. The Marksville Backwater Area is located on the south and west side of the Red River in the vicinity of the town of Marksville, Louisiana.

The survey can be summarized as follows:

1. The object of the survey was to find out of what magnitude is the economic and recreational value of the sport and commercial fisheries of the Larto and Marksville Backwater Area.

2. Statistics for the commercial fishery were obtained by interviewing all known fish dealers who might handle commercial fish from the backwater areas.

3. There was probably some bias in the data obtained for the commercial fishery, however, it is believed that the statistics obtained were accurate enough to meet the objective of the survey.

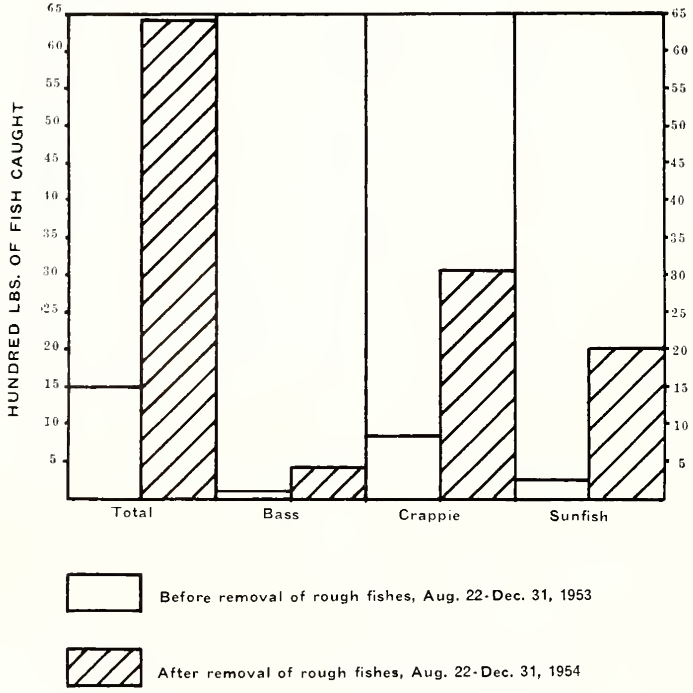
4. The results of the survey shows that a large and valuable commercial fishery exists in the backwater areas.

5. The statistics for the sport fishery were gained in most cases by interviewing owners of all known public docks and boat landings in the backwater areas. In some cases where only launching facilities for boats were available, the person or persons who were thought most qualified to know the extent of the fishing in that area were contacted and interviewed.

6. Due to the manner in which the data was collected for the sport fishery, it is possible that it contains considerable error. Because of the difference in the manner collected, it is believed that the sport fishery statistics are probably less accurate than the commercial fishery. However, it is believed

FIGURE 14

Pounds of fish caught from Clear Lake before and after removal of rough fishes.



that the sport fishery statistics are accurate enough to meet the objective of the survey.

7. It was estimated that the value of the sport and commercial fisheries was approximately six million dollars annually (Table 3). In this estimate the average amount of money each sport fisherman spends to catch a pound of fish was used as the basis in evaluating the sport fisheries. Using the value of catfish as a basis in evaluating the sport fisheries, it was estimated the value of the sport and commercial fisheries was approximately two million dollars annually (Table 4).

8. The results of the survey show that the combined value of the sport and commercial fisheries in the Larto and Marksville Backwater Areas are of a large magnitude.

TABLE NO. 1

Rough fishes removed by seining from Clear Lake.

	Gizzard Shad	Buffalo Fish	Other Fishes	Total
Winter and Spring 1953-54 lbs. of fish removed....	19,973.0	2,782.0	593.7	23,348.7
lbs. of fish removed per acre..........	173.7	24.2	5.3	203.0
Winter and Spring 1954-55 lbs. of fish removed.....	2,254.4	217.5	85.7	2,557.6
lbs. of fish removed per acre................	19.6	1.9	1.1	22.2
Winter 1955-56 lbs. of fish removed......	....	1,192.3	....	1,192.3
lbs. of fish removed per acre................	....	10.4	....	10.4

TABLE NO. 2

Summary of Clear Lake tagging study.

Kind of Fish	Number of Fish Tagged	Tags returned by Sport Fishermen Percent of Total Tagged
Largemouth Bass	16	6
Bluegill Sunfish	636	3
Redear Sunfish	19	11
Longear Sunfish	40	5
Black Crappie	65	0
White Crappie	657	1
Yellow Bass	56	0
TOTAL	1.489	26

TABLE NO. 3

Annual value of commercial and sport fish from Larto and Marksville Backwater Area using the cost of sport fish to sportsmen as a basis in the evaluation of the sport fisheries.

AREA		Pounds of Fish Per Year	Value of Fish
Larto	Commercial Fish	2,787,310	$ 333,160 00
Backwater	Sport Fish	1.689,000	3,148,663 00
AREA TOTAL		4,476,310	$ 3,981,823 00
Marksville	Commercial Fish	648,025	$ 197,851 00
Backwater	Sport Fish	1.144,000	1,867,008 00
AREA TOTAL		1,797,025	$ 2,064,859 00
Both Areas	Commercial Fish	3,435,335	$ 1,031,011 00
	Sport Fish	2,833,000	5,015,671 00
GRAND TOTAL		6,268,335	$ 6,046.682 00

TABLE NO. 4

Annual value of commercial and sport fish from Larto and Marksville Backwater Area using the cost of sport fish if bought at commercial fish prices as a basis in the evaluation of the sport fisheries.

AREA		Pounds of Fish Per Year	Value of Fish
Larto	Commercial Fish	2,787,310	$ 833,160 00
Backwater	Sport Fish	1,689,000	675,600 00
AREA TOTAL		4,476,310	$ 1.508,760 00
Marksville	Commercial Fish	648,025	$ 197,851 00
Backwater	Sport Fish	1.144,000	457.600 00
AREA TOTAL		1.792,025	$ 655,451 00
Both Areas	Commercial Fish	3.435,335	$ 1,031,011.00
	Sport Fish	2.833,000	1.133,200.00
GRAND TOTAL		6,268,335	$ 2,164,211 00

Fish and Game Photo

Bear killed in East Carroll in December 1955

Federal Aid in Wild Life Restoration

Report of Progress
1954-1955

John S. Campbell
State Coordinator, Federal Aid
(Game Section)

John D. Newsom
Assistant Federal Aid Coordinator
(Game Section)

John S. Campbell
Federal Aid Coordinator

Assistant Federal Aid Coordinator John D. Newsom

Jackson-Bienville Game Management Area

The supplementary game food plots were increased from four to eight in number also an additional ten acres of pipeline right-of-way was put into game food production. At least half of each food plot has been planted in a winter cover crop. Reseeding crimson clover, white clover, vetch, singletary peas, fescue, rye grass, oats and wheat have been used with success; but wheat, vetch and crimson clover are by far the best for all-around game use on this area. Summer game foods planted were German millet, sunflower, common lespedeza, buckwheat, reseeding sorghum and peas. Game species using these food plots were deer, quail, squirrel, doves and rabbits. There has been a small flock of turkeys seen on the area. Rabbits have been so abundant around these food plots that they eat up the food meant for other animals.

The deer herd has been steadily increasing for the last two years. At the present rate of increase the deer herd will have reached the carrying capacity of the range in this area and will be ready for annual harvesting in two years.

Squirrel hunting was allowed on this area for 15 days of the past October. A total of 1,758 hunts were made with 3,517 squirrels killed. Hunters from Jackson and Bienville parishes throughly enjoyed the hunt. Cooperation among hunters and Commission employees was excellent.

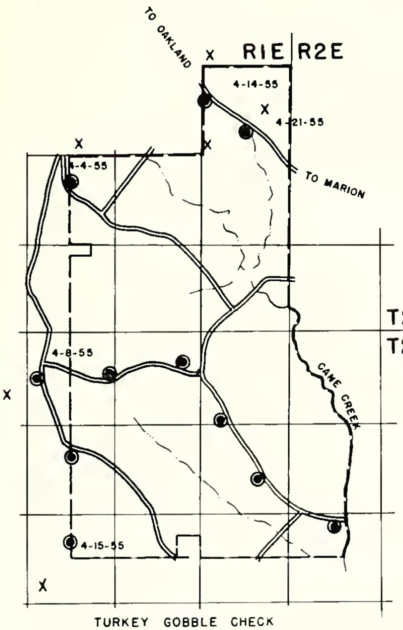
A network of woods, roads and bridges have been maintained to facilitate patrol work and game development. Boundary lines are in the process of being painted and 250 new signs have been placed around the boundary.

Union Parish Game Management Area No. 1

Joe L. Herring, *District Supervisor*
Flavil D. Hollis, *Biologist*
Curtis L. Hollis, *G.M.A. Supervisor*

The Union Parish Game Management Area is located in north-central Union Parish and comprises an area of approximately 10,000 acres. It contains second-growth loblolly and short leaf pine and mixed hard woods with a heavy growth of underbrush and is interspersed

UNION PARISH GAME REFUGE NO. 1



TURKEY GOBBLE CHECK
(INDEX)
APRIL 1955

LEGEND -

— — Boundary Line
◉ Listening Station
x Turkey Gobblers Heard
—.. — Stream Bed

throughout with numerous spring-fed streams. The topography is rolling hills with top soil of sandy loam.

Through cooperation with private landowners this area has been acquired by the State for game management purposes on a long-term lease without fee.

DEER—Prior to the establishment of this Game Management Area there were no deer in this part of Union Parish. Since the inauguration of this project 67 deer have been released. These releases which were made from 1949 to 1951 have been very successful and the deer population is showing a very remarkable increase.

TURKEY—A total of 144 game farm turkeys were released on this area during 1950 and 1951. Survival was very low on these birds but there is some indication that turkeys are producing in the vicinity of the Union Parish Game Management Area.

Fifteen (15) acres of supplementary food plots were reseeded to crimson clover, singletary peas, hairy vetch, and rye grass. These plots were fertilized with 3-12-12 fertilizer at the rate of 300 lbs. per acre. Good stands were obtained and satisfactory growth was made.

Approximately fifteen (15) miles of boundary were brushed out, repainted, and signs replaced during the year. This was necessary due to heavy logging along the boundary roads during the fall and winter months. Metal signs were used to replace the faded masonite signs.

Approximately twelve miles of jeep road were brushed out during the year. Overhanging limbs were cut and deep ruts filled with brush and dirt. Three runway type jeep bridges were constructed using logs from the forest. No decking was used.

Two bridges were torn out and replaced during the year. Decking and timbers used were salvaged from nearby forests.

Twenty salt licks were resalted twice during the year. Ten pounds of salt per lick was used at each salting.

Fences around the food plots were repaired. This included restapling wire where staples had pulled out and gate repair.

The overnight cabin was maintained in a state of good repair. The cabin was repainted using shingle stain on hand. A six foot by eight foot storage room was added to the overnight cabin. At the cabin site a shallow well was dug and a hand pump installed. The work was done by project personnel.

Squirrel, rabbit and mast production studies have continued on the area.

A very successful squirrel hunt was conducted on the Union Parish Game Management Area from Oct. 1 to Oct. 15, 1955. A total of 241 hunters participated in the 15-day hunt. These hunters killed 526 squirrels of which 449 were gray and 77 were fox squirrels.

Evangeline Game Management Area

Horace E. Stiles, *Area Supervisor*

The Evangeline Game Management Area is located on U. S. Forest Service lands in south-central Rapides Parish and contains 15,000 acres of land.

DEER—The deer herd on this area remained in a healthy condition, with no known evidence of disease, parasitism or poaching and has increased satisfactorily.

A total of eight supplementary food plots, with a combined area of 40 acres were cleared and fenced, hog and cattle proof and planted to supplemental foods. These plantings have been used extensively by deer. During the 1955 season, the area surrounding the game management area was opened to deer hunting for a period of seven days. It is estimated that 75 legal deer were killed in this vicinity during the seven-day season.

SQUIRREL—Managed hunts were held in 1954 and 1955. The kill per hunter was slightly higher in 1955. This area produced an excellent mast crop in 1954 and in 1955 the mast crop was almost non-existent. It is recommended that this area be opened annually to controlled hunting. The refuge manager cooperated with the state-wide squirrel study by trapping, ear tagging and releasing squirrels.

QUAIL—Forty one-quarter acre strips were plowed, disced and seeded to lespedeza striata at the rate of 15 pounds per acre. These plantings were successful and have been used extensively by quail.

In addition to the game management work on the Evangeline area, approximately 40 miles of jeep roads or trails and 17 miles of hog proof fence were maintained, 25 bridges and water gates were repaired and maintained. The boundary line was brushed out and signs replaced when necessary.

Sabine Parish Game Management Area No. 1

Lloyd Alford, *Area Supervisor*

The Sabine Parish Game Management Area No. 1 is located in south-central Sabine Parish and comprises approximately 8,000 acres and was established as a management area in 1951.

DEER—During the first two years of its existence, 57 deer were released on the game management area. Survival and reproduction of the deer have been good with no known disease or parasitism. Prelimary observations indicate that removal of deer through hunting or trapping is not desirable at present.

TURKEY—A few turkeys are seen from time to time on the area. These birds are part of releases made in past years and in most cases are still quite tame.

SQUIRREL—This area supports a good population of squirrels. From October 1-15, 1955, a permit hunt, without dogs was held on the area and 369 hunters killed 389 squirrels. The relatively small kill is attributed to the poor hardwood mast crop. The carrying capacity of this area for squirrels is being reduced by the continued harvest of hardwood timber.

During the period covered by this report routine maintenance work was carried on. This included keeping the boundaries brushed, painted and marked, maintaining existing jeep roads and opening new ones, and various other maintenance jobs.

Sabine Parish Game Management Area No. 2

Lloyd Alford, *Area Supervisor*

This game management area is located approximately 10 miles west of Many in Sabine Parish and is about 12,000 acres in size. This area was leased by the State to be used as a game management area in February, 1954. Game species managed are deer and squirrel.

DEER—During 1954 and 1955, 10 bucks and 25 does were released on the area. In an effort to hold the deer near the release point, two plots totaling 10 acres were fenced and planted to winter cover crops. The deer used these plots and from all indications most of the released deer remained on the area. Fawns were observed on the area during the past summer. Salt licks were also established.

SQUIRREL—A managed squirrel hunt was held on the area from October 1-15, 1955. A total of 85 hunters bagged 146 squirrels. Mast failure of the hardwood timber and dry warm weather contributed to the poor kill.

GENERAL—A right of way was established and boundary markers put up. Line trees were painted and the boundary maintained for the past two years. In addition jeep roads were cleared throughout the area and numerous small bridges built and maintained.

Grant-Rapides Game Management Area

T. E. Deen, *Area Supervisor*

The Grant-Rapides Game Management Area is located along the east bank of the Red River in Grant and Rapides parishes. It comprises an area of approximately 7,700 acres.

DEER—The deer herd on this area has increased satisfactorily.

SQUIRREL—A controlled squirrel hunt was held on the area in October 1955. The hunt was highly successful with 2,540 hunters bagging 5,281 squirrels. Because of the need to gather hunting pressure data it is recommended that this area be opened annually to controlled hunting.

TURKEY—Restocking of turkey was attempted, but has been unsucessful. Two food plots with a combined area of 11 acres were maintained. These plots were used to some extent by deer.

In addition to the game management work, the boundary around the entire game management area was brushed out, line trees repainted and signs replaced when necessary. Approximately 25 miles of jeep roads or trails and five bridges were maintained.

Red Dirt Game Management Area

H. C. Beasley, *Area Supervisor*

The Red Dirt Game Management Area, approximately 40,000 acres in size, is located on U. S. Forest Service lands in the south-central portion of Natchitoches Parish.

In July, 1948, through an agreement with the U. S. Forest Service, the State of Louisiana was given the opportunity to develop this land as a game management area.

DEER—Since 1948 the deer herd has been under careful surveillance. Browse and range conditions have been checked yearly. In 1953 the browse conditions indicated an over population of deer and the summer track count verified this indication as the fawn crop dropped to 10 per cent of the total population. A trapping program was inaugurated in January 1954 and plans made to have a managed hunt as soon as possible. From February to April 1954, 75 deer were live trapped and moved to other sections of the state. From November 1954 to April 1955 128 deer were moved to other parishes. From December 1 through December 5, 1955 a managed deer hunt was held on this area. Almost 2,000 hunters participated in this hunt and killed 90 bucks without the use of dogs.

QUAIL—During the period covered by this report no extensive improvements have been made to increase the quail population on this management area. Some experimental work on production of quail foods has been carried on. In December of 1955, a managed quail hunt was held on the area. During the 15-day period, 127 hunters killed 400 quail.

SQUIRREL—This area will probably never be important for squirrel production as only about 10% of the area is suitable habitat. A 15 day permit hunt was held beginning October 1, 1955. A total of 225 hunters killed 252 squirrels.

GENERAL—In addition to game management work and routine maintenance activities, management area personnel have been used as a construction center for research and development projects in the state. A few of the items constructed were deer traps, deer loading crates, deer carrying beds for trucks, acorn traps, squirrel traps and dove traps.

Catahoula Game Management Area

Volmer Bowen, *Area Supervisor*

The Catahoula Game Management Area is located in Winn and Grant Parishes and comprises an area of approximately 40,000 acres.

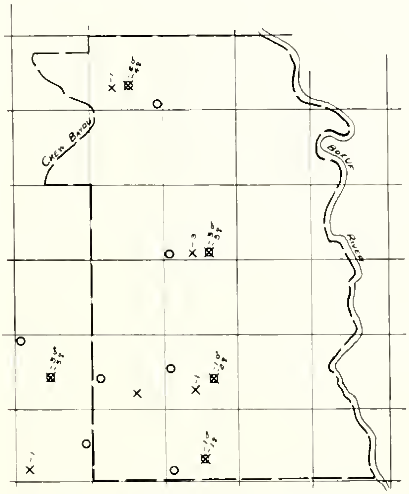
DEER—Game technicians have made periodic surveys of deer food conditions and populations. These surveys in 1954 and 1955 indicated that the deer herd was approaching problem conditions and some deer should be removed from this area in the near future. Plans were made for a controlled hunt and trapping program in 1955. The controlled hunt was deferred, but the trapping of deer for restocking of other areas is in progress.

SQUIRREL—A controlled squirrel hunt was held on this area in October 1954 with 2,369 hunters bagging 3,555 squirrels. Catahoula was not opened to squirrel hunting in 1955. Squirrels were trapped, ear tagged and released in cooperation with the state-wide squirrel study.

TURKEY—The Catahoula area contains satisfactory turkey range. Game farm birds were released on the area, but survival has been very low with little evidence of reproduction.

Twenty-five acres were cleared and planted to supplementary game foods and fifty acres of established food plots were maintained. In addition to the game management work a total of 10.6 miles of hog proof fence were maintained. Hogs were removed from this area, 20 bridges and water gates were repaired and maintained, 62 miles of boundary were brushed out, line trees repainted and signs replaced whenever necessary. The entrance markers at the eight main points of entrance to the area were repainted.

CALDWELL PARISH
GAME MANAGEMENT AREA NO. 1



TURKEY GOBBLE CHECK ON THE CALDWELL GAME MANAGEMENT AREA
INDEX FOR APRIL 1955

SCALE: 1" = 1 Mile

LEGEND-

——— Boundary Line
○ Listening Stations
× Turkey Gobblers Heard
☒ Turkeys Seen

Caldwell Parish Game Management Area

Welch Lively, *Area Supervisor*

The Caldwell Parish Game Management Area is located on the southeastern portion of Caldwell Parish. It comprises about 11,000 acres of lands bordering Boeuf River and is covered by bottomland hardwoods. The topography is relatively flat and poorly drained and is largely covered by overcup oak and water hickory although scattered willow oak are to be found on the ridges.

The entire area was leased without fee from private owners for wildlife management purposes. Originally a total of 93 deer were released here and it is estimated that the area now contains between 75 and 100 deer.

Under natural conditions the area would be capable of carrying a large deer herd but due to the fact that it is presently supporting such a tremendous number of cattle, hogs and goats the deer simply cannot compete for food. It is thoroughly over browsed by these domestic animals and as long as they are permitted to range freely the deer herd will be unable to increase in numbers. The deer here have received excellent protection and care from the refuge manager and the herd is believed to have reached its maximum size under the present range conditions.

As a whole the restocking attempt here can be considered very successful in spite of the fact that the herd has not increased on the Game Management Area proper. A general dispersal of deer from this area has brought about the establishment of a fine deer herd just west of of the management area and the Ouachita River in the Bayou Dan region. The deer herd has built up in good quantity in this region as a result of good range conditions.

Two years ago, 10 exclosures were placed on the management area in order to study the effects of the domestic animals on the deer range. Three of these fenced areas exclude cattle and hogs and the results have been very interesting. Inside the fences rank growths of herbaceous and woody plants are to be found while just outside the fence where livestock range freely the ground is almost completely bare and a browse line can be seen through the timber for approximately seven feet above the ground level. From the forestry viewpoint it was interesting to note that good stands of red gum and elm reproduction were coming in inside the fence and that none was to be found outside. From this exclosure it is believed that the deer range would come back in about two years after the removal of all stock from the area.

A total of 269 game farm turkey were originally released on this area. Some turkey are still to be found but reproduction has been limited apparently by spring over-flows and predation.

Four food plots with a combined area of about 18 acres have been cleared, fenced and planted to supplementary turkey food. These plots have been used extensively by deer and to a small degree by turkey.

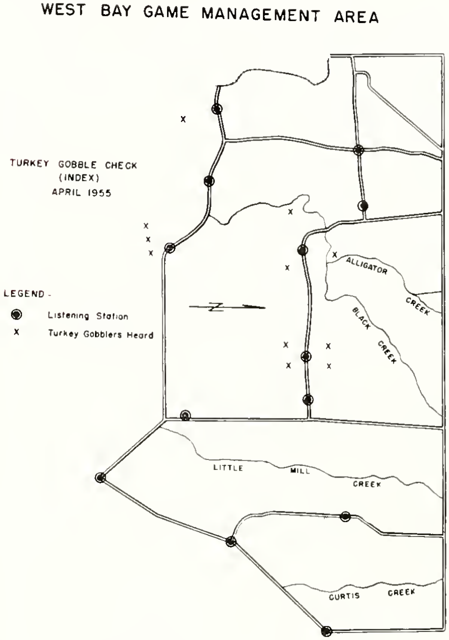
The only means by which this area can be restored as a first class area suitable for wildlife would be to completely eliminate the free range of all domestic stock. This would involve fencing with net wire around at least three sides of the area and possibly around all sides if the Beouf River did not serve as a sufficient barrier. Such a project would naturally be opposed by those using the area for grazing purposes at this time but it nevertheless serves as the only method by which it can be developed for wildlife.

West Bay Game Management Area

Jack Sims, *District Supervisor*
Raymond Rowell, *Area Supervisor*

The West Bay Game Management Area consists of 18,600 acres and is located in Allen Parish. This area is under long term lease to the State and ownership is made up of several large companies. It is through the cooperation of the local people and the land owners of this area, that the establishment of West Bay has been made a success.

The primary objective of West Bay is to re-establish turkey and deer in the area. The land is such that it affords excellent range for deer, turkey and squirrel. Most of the development done on the area has been for deer and turkey. However, some time has been devoted to research on squirrels.



Thirty-five acres of land has been cleared, fenced and planted to crops suitable for turkey management. Crops planted were winter and early spring crops which afford supplementary food. Salt licks are also maintained in this development plan.

According to records kept by the Area Manager and other methods used, there is now a harvestable surplus of deer established in the area surrounding West Bay. With a short season, the hunters of Louisiana should be able to harvest a number of deer in Allen Parish for the first time in many years.

There were a number of game farm turkeys released on the area. Evidence has been found of some reproduction, indicating that the turkeys that now remain apparently have adapted themselves to the wild, and may become established.

There is an abundance of squirrels on West Bay. Plans are being made to have a 15-day open season on the area. No dogs will be allowed for squirrel hunting.

Livingston Parish Game Management Area

The Livingston Parish Game Management Area is located in the southern portion of parish and comprises an area of approximately 10,000 acres. It is relatively flat and poorly drained, containing a dense stand of loblolly pine, mixed hardwood and swamplands. A number of old abandoned fields are to be found throughout the area.

Since this area was established in 1949 a total of 42 deer and 127 game farm turkeys have been released. Four foodplots, with a combined acreage of 55 acres were cleared, fenced and planted to supplemental deer and turkey food.

All masonite boundary signs have been replaced with metal signs, jeep roads maintained and boundary lines brushed out.

The first hunting of any type was permitted in 1954. A season of 15 days, October 1-15, was granted by the Louisiana Wild Life and Fisheries Commission for squirrel hunting only. Hunter bag checks were made daily by biologists and enforcement personnel and a total of 840 hunters was checked. This number of hunters took 2,020 squirrels, or 2.4 squirrels per hunter effort. It is estimated approximately two thirds of all hunters who participated were checked, which gives a rough figure of 3,000 squirrels taken off the area. As best as could be determined, this short season was a success both from the biological and sportsman's standpoint. Some objection was voiced prior to opening the season but this quieted after the sportsmen became more familiar with the situation.

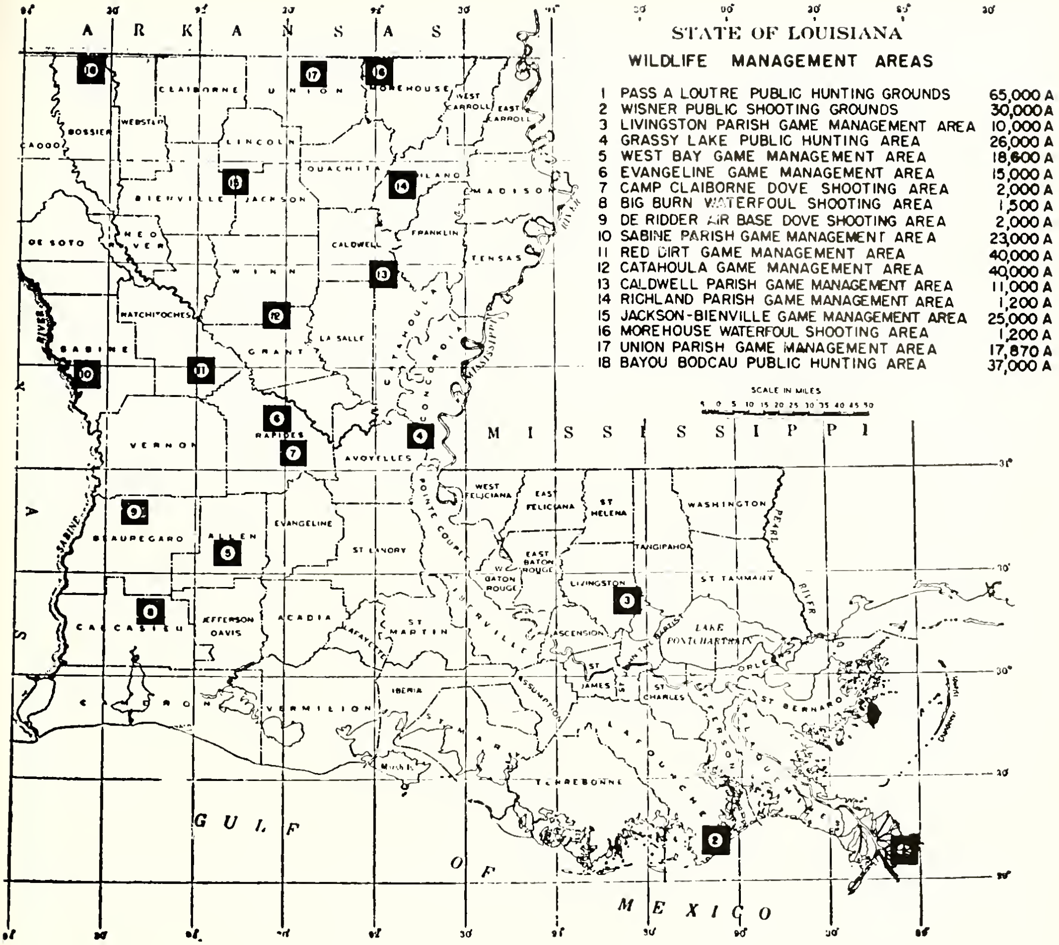
A similar 15-day season was granted in 1955, but the sportsmen were allowed to hunt by permit only. This enabled the biologists to get almost complete coverage on hunter success. During the 1955 season, 1,072 hunters killed 117 fox squirrels and 1,854 gray squirrels for an overall success of 1.8 per hunter effort.

In all probability another short season will be permitted in 1956. Hunting pressure has evidently had no appreciable effect on carry-over population from year to year. The Livingston Parish Game Management area has been serving its purpose as a game management area in that at least some portion of a game species is being harvested where otherwise it would be wasted if the whole area had continued to be closed to all hunting.

Catahoula Lake Waterfowl Development

Richard K. Yancey, *District Supervisor*
Project Leader

During the past two years a considerable amount of work has been carried out on Catahoula Lake in order to improve it for waterfowl. This 21,000 acre area goes partially dry for about three months each year during the late summer. During this period wild millet and chufa, two of our best natural duck foods, grow in profusion on the mud flats and feed a tremendous waterfowl population once the lake bed floods out naturally during the winter. In the past 20 years encroaching stands of water elm and swamp privet have taken over and occupied approximately 4,500 acres of these mud flats and have curtailed the production of waterfowl foods.



STATE OF LOUISIANA
WILDLIFE MANAGEMENT AREAS

1	PASS A LOUTRE PUBLIC HUNTING GROUNDS	65,000 A
2	WISNER PUBLIC SHOOTING GROUNDS	30,000 A
3	LIVINGSTON PARISH GAME MANAGEMENT AREA	10,000 A
4	GRASSY LAKE PUBLIC HUNTING AREA	26,000 A
5	WEST BAY GAME MANAGEMENT AREA	18,600 A
6	EVANGELINE GAME MANAGEMENT AREA	15,000 A
7	CAMP CLAIBORNE DOVE SHOOTING AREA	2,000 A
8	BIG BURN WATERFOUL SHOOTING AREA	1,500 A
9	DE RIDDER AIR BASE DOVE SHOOTING AREA	2,000 A
10	SABINE PARISH GAME MANAGEMENT AREA	23,000 A
11	RED DIRT GAME MANAGEMENT AREA	40,000 A
12	CATAHOULA GAME MANAGEMENT AREA	40,000 A
13	CALDWELL PARISH GAME MANAGEMENT AREA	11,000 A
14	RICHLAND PARISH GAME MANAGEMENT AREA	1,200 A
15	JACKSON-BIENVILLE GAME MANAGEMENT AREA	25,000 A
16	MOREHOUSE WATERFOUL SHOOTING AREA	1,200 A
17	UNION PARISH GAME MANAGEMENT AREA	17,870 A
18	BAYOU BODCAU PUBLIC HUNTING AREA	37,000 A

A D-6 bulldozer working in connection with a crew of men using brush blades have been employed to cope with this problem. Approximately 800 acres of this brush have been cleared and the results produced were considered to be very satisfactory. The water elm areas cleared during the summer of 1954 produced good stands of duck food plants during 1955 and it is expected that the areas cleared during 1955 will again be back in production during the late summer of 1956. As yet sprouting has not produced a problem.

Deer Trapping (Madison and Tensas Parishes)

During February 1955 a small deer trapping operation was carried out on J. W. McLemore's and John Olvey's places in lower Madison Parish. In the course of this operation 25 deer were trapped. Only 10 were does and they were ear tagged, weighed and released in Richland Parish. The remaining 15 were bucks and they were tagged, weighed and released at the trap site.

During December of 1955 preparations were made to carry out a large scale deer trapping operation on the old Singer Refuge in Madison Parish. A total of 100 portable deer traps have been constructed and placed at suitable sites on this area.

In preparation for this operation the D-6 bulldozer was used to construct suitable access roads.

Project 30-D

Zemurray Park Deer Propagation Area

Zemurray Park is a 5,000 acre tract of land located 12 miles northeast of Hammond and owned by Samuel Zemurray. Other than the very beautiful 500-acre flower garden, Zemurray Park is particularly noted for its high deer population. These animals increased to the point they were becoming troublesome so Mr. Zemurray entered into an agreement with the Louisiana Wild Life and Fisheries Commission in 1950 to furnish all the deer the Commission could trap. To date 45 animals in good condition have been removed from the area. Eleven were released in Livingston Parish in 1950-51, two in Red River Parish in 1953-54, 20 in St. Helena in 1954-55, and 13 in St. Helena up to January 1, 1956.

There is good to very good deer browse available to the herd on this area which probably accounts for the fact that there have not been as many animals removed as was formerly thought possible. Poaching has been a factor in trapping success in the past, but with improved enforcement of game laws the illegal kill has dropped considerably and the herd is increasing. A new type deer trap will be used during the latter part of the 1955-56 trapping season which should increase trapping success considerably. This trap is referred to as the California Type and is made of green tuna netting over a light metal frame. Portability will be considerably improved and the trap should be much less conspicuous to the deer.

DISTRIBUTION OF TRAPPED DEER

Trapping Area	Where Released	No. Released
1954		
Red Dirt Game Management Area	Sabine Game Management Area #2	7
"	Ward 2, Natchitoches Parish	5
"	Ward 10, Natchitoches Parish	11
"	Flat Lake Bottom, Webster Parish	20
"	Bayou Bodcau, Bossier-Webster Parishes	20
"	Bienville Parish	10
"	Red Dirt Deer Enclosure	1
1955		
"	De Soto Parish	30
"	Ouachita Parish	30
"	Sabine Game Management Area #2	14
"	Camp Polk Reservation	1
"	Richland Parish	21
"	Red Dirt Deer Enclosure	2
1954		
Avery Island	Sabine Game Management Area #2	9
"	Camp Polk Reservation	32
1954		
Zemurray Park	St. Helena Parish	33
1954		
Madison-Tensas Parishes	Sabine Game Management Area #2	14
"	Bienville Parish	17
"	Red Dirt Deer Enclosure	2
"	Ward 2, Natchitoches Parish	21
1955	Richland Parish	10

Note: Seventeen deer were lost in handling during this period.

Beaver Trapping and Transplanting

Beaver in Southeast Louisiana are quite numerous, particularly in the parishes of East Baton Rouge, East Feliciana, St. Helena, Tangipahoa, Washington, Livingston and St. Tammany. As far as can be determined there has been a considerable increase in population over the past 15 years. According to local residents, the first animals to be reintroduced into this section of the state since the area was denuded of beaver years ago were released in Mississippi in the head waters of the Tickfaw River.

Live beaver trapping was initiated in Louisiana as a result of complaints that the animals were damaging timber, blocking drains, destroying corn and tunneling into dams and levees. Since there was a year round closed season on beaver, land owners could not remove the animals and were forced to turn to the state for assistance.

Each animal trapped is sexed, aged, weighed and marked with a small metal tag at the base of the ear. Releases are made under the direction of the various district supervisors over the state. Care is taken to see that no releases are made where the animal may later become a nuisance.

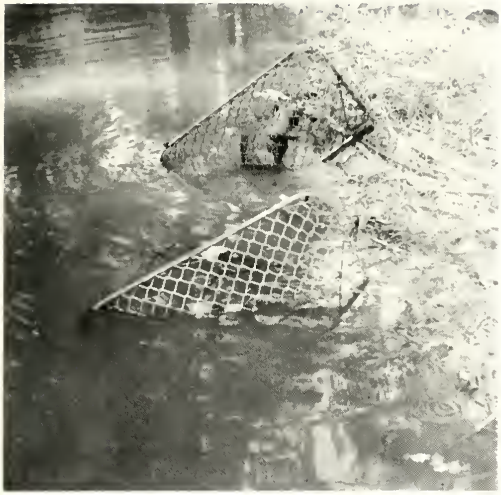
During the 1954-55 biennium, 91 animals were trapped, 75 of which were released in good condition. The parishes in which a majority of the releases were made were Morehouse, Grant, Concordia, Allen and LaSalle.

The average weight of all animals weighed was 31 pounds. At least one 65-pound beaver has been trapped in Louisiana since the project was begun.

Farm Game Habitat Improvement

Kenneth C. Smith, *District Supervisor*
Project Leader

Louisiana, like many other states, has witnessed a serious decline in small game populations in the past 20 years. In order to at least partially correct this situation, the Farm Game Program was initiated in 1942. Earlier research had indicated a need for habitat improvement, so a work plan was drawn up which called for the purchase and distribution of planting materials and fertilizer. **Lespedeza sericea** and bicolor seed along with the recommended planting instructions were distributed to land owners over the state. Periodic checks were made by trained biologists.



Beaver in livetrap ready for transplanting.

As the program increased, bicolor seedlings replaced the seed since the use of the former cut a year off the nonproductive maturing stage of the plant. There was also less competition from weeds and grass during the first growing season.

The distribution of **Lespedeza sericea** has been discontinued due to lack of success with this material. Sericea is an excellent plant when used in conjunction with bicolor because it furnishes good nesting sites and in some instances serves as a source of food.

During the past five years, 3,302,000 bicolor plants have been distributed to interested land owners throughout the state. In 1954, only 128,000 plants were available and this number was far short of requests. One million seedlings were ordered in 1955 and this number was sufficient to meet all requests.

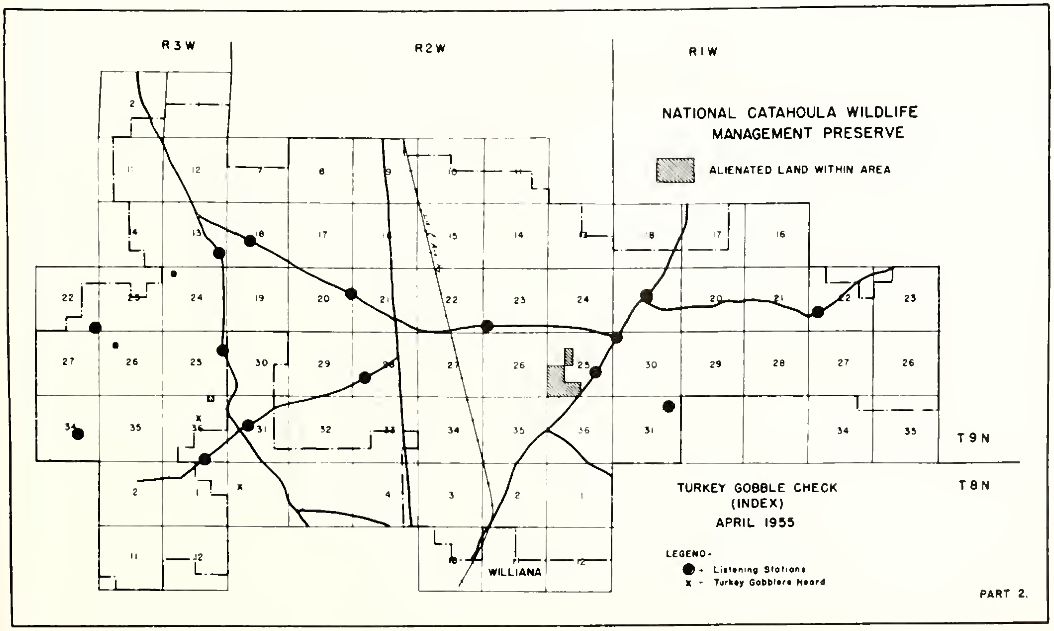
In the fall of 1955 a new phase of habitat improvement was initiated. This new work plan calls for the flat breaking of ¼ to ½ acre strips of land on property to which there is public access. A 2-ton truck, tractor and disc have been purchased for this phase of operations and shortly after December 31, 1955 a tractor operator will be hired to work entirely on this project.

There are large tracts of land to be found in the Florida Parishes where hunters are welcome but game is scarce. It is expected the small game species such as rabbit and quail will benefit by the legumes and other desirable plants which appear in newly broken ground. In areas where pine straw has been accumulating for 3 or more years the animals are suppressed. The turning over of the soil will permit the desired plant succession to take place.

Where the situation requires, fertilizer will be applied and/or common lespedeza seed will be planted. In no case will the lespedeza be planted where native stock is present. All seed will be innoculated before planting.

The Soil Scarification phase will be limited to District 7 during the first year or until its feasibility has been determined. If successful, it will be set up on a state-wide basis. The principal aspects involved are the degree of mobility of the equipment and general attitude of land owners.

—Submitted by: Kenneth C. Smith,
Supervisor, District VII


R 3 W
R 2 W
R I W
NATIONAL CATAHOULA WILDLIFE MANAGEMENT PRESERVE
ALIENATED LAND WITHIN AREA
T 9 N
T 8 N
TURKEY GOBBLE CHECK (INDEX) APRIL 1955
LEGEND -
● - Listening Stations
X - Turkey Gobblers Heard
WILLIANA
PART 2.

Terzia Game Management Area

Joe L. Herring, *District Supervisor*
Fred Freeland, *G.M.A. Supervisor*

The Terzia Game Management Area is located approximately five miles northwest of Bastrop, Louisiana, in the central portion of Morehouse Parish. It comprises an area of approximately 46,000 acres of mixed hardwood. The topography is gentle rolling terrain. The use of this land for wildlife management purposes has been acquired from the Crosset Lumber Company.

DEER—The deer herd on this area remained in a healthy condition and is increasing at a normal rate.

TURKEY—This area is supporting one or more flocks of wild turkey. Planting of supplementary food plots will be made to increase the present population.

The entire right-of-way around the boundary has been maintained, line trees painted and boundary markers replaced wherever necessary.

Deer and Turkey Investigations in Louisiana

Job No. 1

Status of Released Turkey

Only two game management areas reported turkey observations for the quarter ending in November. A total of 10 birds was seen on the Caldwell area in September. One gobbler, one hen and three young turkeys were observed on the area September 11, 1954, and two hens, and three young birds were sighted September 18, 1954.

In November 1954, eleven hens and seven gobblers were observed on the area.

Thirteen turkeys, (5 hens, 1 gobbler, and 7 young), were observed on the Catahoula Game Management Area between September 2 and September 27, 1954.

For the quarter ending in February, the Union and West Bay Game Management Areas reported turkey observations. Sight records for Union were as follows:

December—2 gobblers and 1 hen.
January—1 gobbler.
February—1 gobbler.

Turkey sign, tracks and droppings, was noted on several different occasions.

West Bay reported a total of 53 turkeys seen on or near the game management area during January and February.

Two gobblers and four hens were sighted on the Catahoula area in March, and one gobbler and three hens were observed here in April 1955.

No nesting activity was reported from any of the study areas.

Work Plan I — Job No. 2

Turkey Population Index

The annual turkey gobbling check was conducted on the study areas in April 1955. Thirteen listening stations were established on the West Bay area, with negative results March 24 and April 12, 1955. Thirteen gobblers were heard, from six stations on April 26, 1955. See Diagram I for locations.

Six turkeys were heard on the Union Game Management Area between April 4 and April 22, 1955. Only one gobbler was sighted during this check period. Location of these birds was essentially the same as last year. See Diagram II.

Supervising Biologist Morton Smith examines kill from game management area.

Fifteen listening stations were employed on the Catahoula Game Management Area. No turkeys were heard gobbling on April 7 and 11, 1955. Only three gobblers were heard during the check period, and these birds were heard on April 12, 1955. See Diagram III for location of these birds.

Since the last quarterly report, it appears that some of the turkeys have moved back onto the Caldwell Area from the Bayou Dan hills. Eight gobblers were heard, on this area, during the check period between April 6 and 27, 1955. In addition to the turkeys heard, seven gobblers and 12 hens were sighted. See Diagram IV for turkey location.

In comparison to last year's gobbling check, it is indicated that the turkey population is lower on all study areas this year than it was the previous year.

No turkeys were heard or seen on the Red Dirt Game Management Area.

Work Plan I — Job No. 3

Survival and Population of Deer

The deer track count on the Red Dirt Game Management Area was conducted in August 1954, and again in January 1955.

A total of 1,567 deer tracks were counted on the six mile check run over a ten day period in August. Fawn tracks comprised approximately seven per cent of the total tracks recorded. Twenty-six deer were observed along the check route for the 10 day period. Composition of the deer observed were as follows: Five bucks, sixteen does, and five young deer of undetermined sex. See Table I for breakdown of observations by dates.

Fish and Game Photos

Deer trap used for trapping and transplanting

The January check revealed 1,306 deer tracks counted, and thirteen deer (10 does and 3 young) observed over the six mile check run. See Table II.

DEER POPULATION INDEX (TRACK COUNT)
RED DIRT GAME MANAGEMENT AREA

August 1954 — Six Mile Check Run

Date	Deer Observed					No. Deer Tracks Seen
	Male	Female	Young	Adult	Fawn	Total
8/1/54	1	8	0	166	16	182
8/2/54	0	0	0	168	9	177
8/3/54	0	2	1	150	30	180
8/4/54	0	2	0	131	16	147
8/5/54	1	2	1	134	18	152
8/6/54	0	1	0	116	22	138
8/7/54	3	0	1	98	13	111
8/8/54	0	1	2	111	9	120
8/9/54	0	0	0	152	17	169
8/10/54	0	0	0	175	16	191
TOTAL	5	16	5	1400	116	1567

DEER POPULATION INDEX (TRACK COUNT)
RED DIRT GAME MANAGEMENT AREA

January 1955 — Six Mile Check Run

Date	No. Deer Observed	No. Deer Tracks Seen
1/11/55	1 doe	171
1/12/55		104
1/13/55		119
1/14/55		104
1/16/55		138
1/7/55		137
1/19/55	9 does	189
1/20/55	3 young	121
1/22/55		127
1/23/55		96
Total	13	1306
Average		130.6
Tracks hr. day		5.44

Work Plan I — Job No. 4

Results of Deer Corral

The two doe deer previously released in the South 40-acre deer corral, were discovered dead sometime in October. Cause of death was undetermined. It is believed that the activity of a sawmill and log hauling in the vicinity of the corral played some part in the death of the two deer.

A small doe was placed in this corral on Jan. 17, 1955, and another doe released in the corral on March 25, 1955 to replace the two deer which had died.

A deer drive within the two 40-acre corrals on February 24, 1955 revealed the following:

South 40, 1 small doe (apparently the one released Jan. 17, 1955)

North 40, one doe, one buck, one fawn.

The fawn was very small and appeared to be suffering from malnutrition.

Although a three-month period elapsed, where no deer were present in the south 40 deer corral, a browse survey conducted in March revealed 5 plants had a browse index of 100 or better. (See Table III). A total of 25 plants were found to have been browsed, with sassafras comprising the highest browse index. Greenbrier, sassafras, poison sumac, yaupon and gallberry made approximately 58 percent of the total food eaten. The survey was limited to 20 permanent plots.

In addition to the 20 permanent plots (Table III), 30 random sample plots were also run in this area. Four plants were found with a browse index in excess of 100 in this survey (See Table IV). Apparently there is sufficient browse within the corral to support 2 deer. The above mentioned plants that were browsed in excess of 100 are found to be the most palatable of all plants consumed, as evidenced by other browse surveys.

The browse survey in the North 40 acre deer corral, as determined from the 20 permanent plots, showed a browse index in excess of 100 on thirteen species of plants. (See Table V). In addition to the 20 permanent

Deer are moved from traps in small transfer crates plots under study in the North 40 corral, 30 random plots were surveyed for browse conditions (See Table VI). Seventeen species of plants were found to have a browse index in excess of 100 in this survey. It is interesting to note that wax myrtle **(Myrica ceriferia)** was one of the plants with a browse index in excess of 100. This was the case in both the 20 permanent plots and also in the 30 random plots. In the past, wax myrtle had hardly been touched by deer, and it was assumed that this plant was not palatable and would probably never be consumed in any quantity by deer.

In all probability the deer in the North 40 are on a starvation diet. Remember this is the 40 in which the fawn was sighted and later found dead.

TABLE III

20 PERMANENT PLOTS—SOUTH 40 ACRES DEER CORRAL ON RED DIRT GAME MANAGEMENT AREA

March 1955

Browse Species	Percent of Plots Present	Average Density	Average Degree of Browsing	Utilization Factor	Percent of Food Eaten	Percent of Browse Available	Browse Index
Alder	10 00	.15	1 00	.15	.07	.52	2 50
Azalea	30.00	2.50	3.33	8.33	4 07	8.65	8.33
Blackberry	25 00	.10	25 00	2.50	1.22	.35	62.50
Blackgum	10.00	.15	2.00	.30	.15	.52	2.50
Chokeberry	15 00	.15	25 00	3.75	1.83	.52	62.50
Dogwood	40.00	4 25	7.50	31 88	15.56	14.71	4 69
French Mulberry	5 00	.20	5.00	1.00	49	69	12.50
Pine	35 00	.95	6 00	0.00	00	3.29	.00
Gallberry	10.00	1.10	50.00	55.00	26 85	3.81	125.00
Grape	5.00	.05	30.00	1.50	.73	.17	75.00
Greenbrier	25 00	.50	62 00	31 00	15 13	1 73	155.00
Huckleberry	55.00	12.00	1.55	18 60	9 08	41.52	3 86
Maple	10 00	.35	11 00	3 85	1.88	1 21	27.50
Maple leaf Viburnum	5.00	.05	25.00	1.25	61	.17	62.50
Poison Sumac	10 00	.10	40.00	4.00	1.95	.35	100.00
Possumhaw	20.00	.40	12.50	5.00	2 44	1.38	31.25
Redbay	15 00	.75	4.00	3 00	1.46	2 60	10.00
Sassafras	10.00	.15	90 00	13.50	6.59	.52	225.00
Sweetgum	25.00	.60	1 00	.60	.29	2 08	2.50
St. Andrews Cross	5.00	.05	.00	.00	.00	.17	.00
Wax Myrtle	35.00	3.20	1.00	3.20	1.56	11.07	2.50
Witchhazel	10.00	.25	1.00	.25	.12	.87	2.50
Whitebay	10 00	.30	1 00	.30	.15	1.04	2.50
Winged Sumac	20.00	.30	5.50	1.65	.81	1.04	13.75
Yaupon	10.00	.30	47.50	14.50	6.96	1.04	118 75

Waterfowl Biologist and District Supervisor Richard K. Yancey chats with R. D. Moody before check with Pilot Nelson Summerell.

TABLE IV

30 RANDOM PLOTS — SOUTH 40 ACRES DEER CORRAL ON RED DIRT GAME MANAGEMENT AREA

March 1955

Browse Species	Percent of Plots Present	Average Density	Average Degree of Browsing	Utilization Factor	Percent of Food Eaten	Percent of Browse Available	Browse Index
Alder	13.33	.17	2 33	.40	61	1.86	5 63
Arrowwood	3.33	03	00	.00	00	.33	00
Azalea	6 67	.10	.00	.00	.00	1.10	00
Blackberry	13.33	13	18.75	2.44	3.73	1.43	46 88
Blackgum	10 00	.17	67	11	17	1 86	1.67
Chokeberry	6.67	07	50.00	3.50	5 34	.77	125 00
Dogwood	36 67	1 00	.64	64	98	10 96	1 59
French Mulberry	23.33	67	1 57	1 05	1 60	7 35	2.50
Gallberry	6 67	10	47.50	4 75	7 25	1.10	118 75
Grape	16 67	20	31 00	6 20	9 47	2 19	77.50
Pine	56 67	97	.29	.28	.43	10 64	.74
Greenbrier	16 67	.20	44 00	8.80	13 44	2 19	105 00
Hawthorn	3.33	03	10 00	.30	.46	.33	25 00
Huckleberry	33.33	1 17	5 00	5 85	8.93	12 83	12.50
Winged Sumac	3.33	.03	.00	00	.00	.33	00
Maple	3 33	03	.00	00	00	.33	0 00
Ilex decidua	3.33	03	30 00	90	1 37	.33	75 00
Poison Sumac	6 67	.07	.00	00	.00	.77	00
Possumhaw	16 67	43	3 33	1 43	2 18	4 71	6 00
Rattan	3.33	.03	30 00	90	1 37	.33	75 00
Redbay	10 00	.33	00	00	.00	3 62	00
Sassafras	3 33	03	.00	00	.00	33	00
Prunus	3.33	03	30 00	90	1 37	.33	75 00
St. Andrews Cross	20 00	23	11 67	2 68	4 09	2 52	29 17
Sweetgum	16 67	70	.00	00	.00	7.68	.00
Sweetleaf	6 67	07	00	00	00	.77	00
Va. Willow	10 00	13	55 00	7 15	10 92	1.43	137.50
Water Oak	6 67	.10	20.00	2 00	3.05	1 10	50 00
Witchhazel	6 67	.13	5.00	65	99	1.43	12.50
Yaupon	13.33	.27	21.25	5.74	8.76	2.96	53.13
Yellow Jessamine	6 67	67	12.50	8 38	12 80	7.35	31.25
Fringe Tree	3 33	.03	00	.00	.00	.33	.00

Data is taken on kill at Red Dirt by District Biologist Joe L. Herring.

TABLE V

20 PERMANENT PLOTS — NORTH 40 ACRES
BROWSE SURVEY OF DEER CORRAL
ON RED DIRT GAME MANAGEMENT AREA

March 1955

Browse Species	Percent of Plots Present	Average Density	Average Degree of Browsing	Utilization Factor	Percent of Food Eaten	Percent of Browse Available	Browse Index
Alder	35.00	2.00	4.43	8.86	1.00	6.78	11.07
Azalea	35.00	85	23.86	20.28	2.29	2.88	59.64
Blackberry	10.00	10	37.50	3.75	42	34	93.75
Blackgum	20.00	35	1.375	4.81	54	1.19	34.38
Chokeberry	20.00	.75	21.25	15.94	1.80	2.54	53.13
Dogwood	45.00	2.50	3.67	9.18	1.04	8.47	9.17
Fr. Mulberry	20.00	1.30	46.25	60.13	6.79	4.41	115.63
Pine	65.00	1.15				3.90	.00
Gallberry	25.00	1.15	88.00	101.20	11.44	3.90	220.00
Grape	10.00	15	20.00	3.00	.34	.51	50.00
Aromatic Sumac	5.00	.20	60.00	12.00	1.36	68	150.00
Greenbrier	35.00	.75	78.57	58.93	6.66	2.54	196.43
Holly	20.00	75	2.00	1.50	17	2.54	5.00
Huckleberry	50.00	3.50	1.80	6.30	.71	11.86	4.50
Maple	30.00	1.30	11.50	14.95	1.69	4.41	28.75
Poison Sumac	20.00	20	80.00	16.00	1.81	.68	200.00
Possumhaw	20.00	.95	18.00	17.10	1.93	3.22	45.00
Rattan	5.00	05	30.00	1.50	.17	17	75.00
Redbay	15.00	.35	90.00	31.50	3.56	1.19	225.00
Sassafras	10.00	10	27.50	2.75	.31	.34	68.75
Silverbell	5.00	30	40.00	12.00	1.36	1.02	100.00
Sweetgum	45.00	1.15	16.00	18.40	2.08	3.90	40.00
Sweetleaf	10.00	.25	82.50	20.63	2.33	85	206.25
Va. Willow	5.00	.10	60.00	6.00	.68	.34	150.00
St. Andrews Cr.	25.00	25	43.00	10.75	1.21	.85	107.50
Wax Myrtle	45.00	5.50	48.56	267.08	30.18	18.64	121.39
Witchhazel	5.00	.50	2.00	1.00	.11	1.70	5.00
Whitebay	25.00	1.50	75.00	112.50	12.71	5.08	187.50
Winged Sumac	25.00	.65	6.80	4.42	.50	2.20	17.00
Yaupon	20.00	.85	50.00	42.50	4.80	2.88	125.00

Work Plan I — Job No. 5

Deer Browse Survey (Aldous Method)

The deer browse survey conducted on the Red Dirt Game Management area was based on 700 random sample plots. (See Table VII). Five hundred of these plots were run in some 32,000 acres of cattle free range, and 200 plots were recorded in an 8,000 acre area where cattle are present. Four species of plants were found to have been browsed for an index in excess of 100. However, gallberry with a browse index of 137.50, makes up only a small percentage of available browse on the area. Wax myrtle was browsed lightly in the sample on this area, in contrast to heavy browse on the same plant within the enclosures (deer corral). Greenbrier, French mulberry, sweetleaf, Virginia willow, whitebay and yaupon was browsed more heavily than the other plants in the survey. Greenbrier was the most critically browsed plant of all, with the available browse comprising 5.05 percent. The percentage of food eaten on this same plant was 18.36. It is easy to see that percentage of food eaten is considerably out of proportion to the percentage of available browse.

Three species of plants were found to have a browse index in excess of 100, on the five hundred sample plots conducted on the cattle free area of Red Dirt in March 1955. Gallberry, with a browse index of 137.50, is probably not too significant as it only comprised .80 per cent of the plots present in the entire sample. (See Table VIII).

Seven species of plants, (Table IX) were revealed to have been browsed for an index in excess of 100, based on the 200 sample plots conducted in the area where cattle were present. It is interesting to note that in the case of each species of plant, the browse index is considerably higher than for those same plants on the cattle free area.

A total of 401 sample browse plots was conducted on the Catahoula National Wildlife Preserve in March 1955. Of these 401 plots, 108 were limited to the fenced area which is approximately 360 acres in size. This fence excludes cattle but will admit deer.

TABLE VI

30 RANDOM PLOTS — NORTH 40 ACRES
BROWSE SURVEY OF DEER CORRAL
ON RED DIRT GAME MANAGEMENT AREA

March 1955

Browse Species	Percent of Plots Present	Average Density	Average Degree of Browsing	Utilization Factor	Percent of Food Eaten	Percent of Browse Available	Browse Index
Alder	16.67	23	67.00	15.41	2.86	2.32	167.50
Arrowhead	3.33	.03	60.00	1.80	33	30	150.00
Azalea	10.00	.10	20.00	2.00	37	1.01	50.00
Blackberry	10.00	.17	81.67	138.84	25.73	1.72	204.17
Blackgum	3.33	.03				0.00	0.00
Chokeberry	6.67	.07	30.00	2.10	39	71	75.00
Dogwood	30.00	1.06	4.63	4.91	91	10.71	10.28
Fr. Mulberry	10.00	37	26.33	9.74	1.81	3.74	65.83
Pine	46.67	1.03				10.40	0.00
Gallberry	10.00	20	90.00	18.00	3.34	2.02	225.00
Grape	26.67	40	58.75	23.50	4.36	4.04	146.83
St. Andrews Cr.	20.00	20	47.50	9.50	1.76	2.02	118.75
Greenbrier	16.67	.20	79.00	15.80	2.93	2.02	197.50
Hawthorn	3.33	03	70.00	2.10	39	30	175.00
Huckleberry	16.67	33	30.40	10.03	1.86	3.33	76.00
Maple	16.67	.30	24.00	7.20	1.33	3.03	60.00
Poison Sumac	3.33	03	50.00	1.50	28	30	125.00
Possumhaw	16.67	33	23.00	7.59	1.41	3.33	57.50
Rattan	6.67	07	82.50	5.78	1.08	71	206.25
Redbay	10.00	13	85.00	10.50	1.95	1.31	212.50
Sassafras	6.67	10	75.00	7.50	1.39	1.01	187.50
Silverbell	6.67	07	2.50	18	03	71	6.25
Sweetgum	3.33	.10				1.01	0.00
Va. Willow	13.33	60	85.00	51.00	9.45	6.06	212.50
Water Oak	6.67	13	65.00	8.45	1.57	1.31	162.50
Wax Myrtle	20.00	2.50	54.17	135.04	25.03	25.25	135.42
Witchhazel	3.33	03				.30	0.00
Whitebay	10.00	.13	80.00	10.40	1.93	1.31	200.00
Winged Sumac	13.33	23	16.25	3.74	69	2.32	40.63
Yaupon	6.67	60	57.50	34.50	6.39	6.06	143.75
Vib.	3.33	07	30.00	2.10	39	.71	75.00
Prunus	3.33	03	10.00	.30	06	.30	25.00

The browse survey, based on 401 sample plots, shows that greenbrier and red cedar were browsed for an index of 127.86 and 193.75 respectively. The average density was relatively low for all plants in the sample. (See Table X). Indications are, that the deer population is out of balance with the browse available. However, the condition of the range is influenced by the presence of cattle.

The fenced area, where browse is attributed only to deer, showed a comparatively high index of browsing. Greenbrier had a browse index of 133.70 (See Table XI), and pine showed a browse index of 31.79. This is the first time in the history of the browse survey that pine has been browsed.

Greenbrier was the only plant with a browse index in excess of 100, as certained from 293 random sample plots on the open range survey. (See Table XII). Twenty-five species of plants were recorded as having been browsed in this survey. Of these 25 plants greenbrier alone furnished 48% of the total food eaten.

TABLE VII

DEER BROWSE SURVEY OF RED DIRT GAME MANAGEMENT AREA
BASED ON 700 RANDOM PLOTS
INCLUDING COW PASTURE & CATTLE FREE AREA

March 1955

Browse Species	Percent of Plots Present	Average Density	Average Degree of Browsing	Utilization Factor	Percent of Food Eaten	Percent of Browse Available	Browse Index
Alder.	10 86	.50	8.47	4.24	3.33	3 82	21.18
Arrowwood.	2.57	.12	14.22	1.71	1.34	92	35.56
Azalea	12 00	.59	5.20	3.07	2 41	4.51	13.01
Blackberry.	9 29	.16	14.74	2.36	1 85	1 22	36.85
Chokeberry..	.86	.02	.33	.01	01	15	.83
Blackgum	15.57	.73	10.90	7.96	6 24	5.58	27.25
Dogwood	3 71	.14	16.73	2.34	1 84	1.07	41.83
Fr. Mulberry	4.43	.20	23.48	4 70	3.69	1.53	58.71
Grape...	1 29	.06	23.78	1 43	1 12	.46	59.44
Greenbrier	22.29	66	35 47	23.41	18 36	5 05	88.69
Hawthorn ..	4 14	.33	2 59	.86	67	2 52	6 47
Huckleberry	34 43	1 68	5.91	9 93	7.79	12 84	14 76
Winged Sumac	3 00	05	4 38	22	17	38	10.95
Maple	15 86	.55	8 76	4 82	3 78	4 20	21.89
Possumhaw	5 43	.33	16 18	5 34	4 19	2.52	40.46
Rattan	1 00	.02	50.71	1 01	79	.15	126.79
Pine.	37 43	1 61	00	.00	.00	12.31	.00
Sassafras	2 00	.02	19 64	.39	.31	15	49.11
Silverbell	5.00	.13	12 51	1 63	1 28	99	31.29
St. Andrews Cr..	14 29	.17	17.69	3 01	2.36	1 30	44 23
Sweetgum ...	19 86	.86	.63	.54	.42	6 57	1.57
Sweetleaf	7.57	37	20.36	7.53	5 91	2 83	50 90
Va. Willow	3 43	17	50.42	8.57	6.72	1.30	126 04
Water Oak	5 57	12	8 92	1 07	.84	92	22 31
Wax Myrtle..	33 00	2 14	2.04	4 37	3 43	16 36	5 11
Whitebay...	14 00	48	32.90	15 79	12 38	3 67	82.25
Witchhazel..	7 86	40	2.26	.90	.71	3.06	5.64
Yaupon	6 43	24	17.49	4 20	3 29	1 83	43.72
Yellow Jessamine	12.00	.14	21.58	3.02	2.37	1 07	53 96
Fringe tree	1 43	02	73.50	1 47	1.15	15	183.75
Green ash	.29	003	35.00	.11	.09	02	87 50
Mapleleaf Viburnum..	14	003	20.00	06	.05	02	50.00
Poison Sumac..	1.57	02	23 64	47	37	15	59 09
Gallberry	.57	007	55.00	.39	31	05	137 50
Redbay	2 00	.03	18 86	.57	.45	.23	47.14

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TABLE VIII

DEER BROWSE SURVEY OF RED DIRT GAME MANAGEMENT AREA BASED ON 500 PLOTS—CATTLE FREE

March 1955

Browse Species	Percent of Plots Present	Average Density	Average Degree of Browsing	Utilization Factor	Percent of Food Eaten	Percent of Browse Available	Browse Index
Alder	8.20	42	93	39	42	3.26	2.32
Arrowwood	2.40	10	10.17	1.02	1.10	78	25.42
Azalea	11.40	.61	6.16	3.76	4.07	4.74	15.40
Blackberry	9.20	.17	11.28	1.92	2.08	1.32	28.21
Blackgum	15.40	.76	7.60	5.78	6.26	5.91	18.99
Chokeberry	1.00	01	00	.00	.00	08	.00
Dogwood	2.40	.05	9.25	46	50	39	23.13
Fr. Mulberry	3.00	14	16.07	2.25	2.44	1.09	40.17
Gallberry	.80	01	55.00	.55	60	.08	137.50
Grape	80	05	3.50	18	19	.39	8.75
Green Ash	40	004	35.00	14	15	03	87.50
Greenbriar	21.00	66	28.94	19.10	20.68	5.13	72.36
Hawthorn	4.40	42	2.68	1.13	1.22	3.26	6.71
Huckleberry	29.60	1.41	3.32	4.68	5.07	10.96	8.31
Winged Sumac	2.00	03	5.70	17	.18	.23	14.25
Maple	16.60	59	7.71	4.55	4.93	4.58	19.28
Mapleleaf Viburnum	.20	004	20.00	.80	87	03	50.00
Poison Sumac	2.20	03	23.64	.71	77	.23	59.09
Possumhaw	4.20	25	16.29	4.07	4.41	1.94	40.71
Rattan	80	02	43.75	.88	95	.16	109.38
Redbay	2.80	04	18.86	.75	.81	.31	47.14
Pine	35.80	1.46	.00	00	00	11.34	0.00
Sassafras	1.20	01	30.83	.31	34	.08	77.08
Silverbell	5.60	13	10.39	1.35	1.46	1.01	25.98
St. Andrews Cr.	11.00	14	8.64	1.21	1.31	1.09	21.59
Sweetgum	19.20	.83	40	33	36	6.45	.99
Sweetleaf	6.60	.36	18.85	6.79	7.35	2.80	47.12
Va. Willow	2.40	08	45.83	3.67	3.97	62	114.58
Water Oak	5.00	13	8.64	1.12	1.21	1.01	21.60
Wax Myrtle	36.30	2.51	97	2.43	2.63	19.50	2.43
Whitebay	15.40	.58	23.88	13.85	14.99	4.51	59.71
Witchhazel	6.60	38	1.36	.52	56	2.95	3.41
Yaupon	6.80	30	1.559	4.68	5.07	2.33	38.97
Yellow Jessamine	13.60	.17	13.35	2.27	2.46	1.32	33.38
Fringe tree	60	.01	55.00	.55	.60	08	137.50

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TABLE IX

BROWSE SURVEY OF RED DIRT GAME MANAGEMENT AREA BASED ON 200 PLOTS — COW PASTURE

March 1955

Browse Species	Percent of Plots Present	Average Density	Average Degree of Browsing	Utilization Factor	Percent of Food Eaten	Percent of Browse Available	Browse Index
Alder	17.50	.70	17.31	12.12	6.03	5.13	43.29
Arrowwood	3.00	.20	22.33	4.47	2.23	1.47	55.83
Azalea	13.50	.52	3.19	1.66	.83	3.81	7.96
Blackberry	9.50	.14	24.05	3.37	1.68	1.03	60.13
Blackgum	16.00	.65	18.84	12.25	6.10	4.77	47.11
Chokeberry	.50	.03	2.00	.06	.03	.22	5.00
Dogwood	7.00	.37	23.14	8.56	4.26	2.71	57.86
Fr. Mulberry	8.00	.34	30.44	10.35	5.15	2.49	76.09
Grape	2.50	.09	40.00	3.60	1.79	.66	100.00
Greenbrier	25.50	.67	48.92	32.78	16.32	4.91	122.30
Hawthorn	3.50	.13	2.29	.30	.15	.95	5.71
Huckleberry	46.50	2.38	10.01	23.82	11.86	17.45	25.03
Winged Sumac	5.50	.09	3.18	.29	.14	.66	7.95
Maple	14.00	.45	11.86	5.34	2.66	3.30	29.64
Possumhaw	8.50	.52	16.06	8.35	4.16	3.81	40.15
Rattan	1.50	.02	60.00	1.20	.60	.15	150.00
Pine	41.50	1.98	.00	.00	.00	14.52	.00
Sassafras	4.00	.05	11.25	.56	.28	.37	28.13
Silverbell	3.50	.14	21.00	2.94	1.46	1.03	52.50
St. Andrews Cr.	22.50	.24	28.76	6.90	3.44	1.76	71.89
Sweetgum	21.50	.91	1.14	1.04	.52	6.67	28.49
Sweetleaf	10.00	.38	22.85	8.68	4.32	2.79	57.13
Va. Willow	6.00	.39	55.00	21.45	10.68	2.86	137.50
Water Oak	7.00	.11	8.80	.97	.48	.81	22.00
Wax Myrtle	25.00	1.21	.70	.85	.42	8.87	1.75
Whitebay	10.50	.24	65.95	15.83	7.88	1.76	164.88
Witch-hazel	11.00	.45	3.59	1.62	.81	3.30	8.98
Yaupon	5.50	.10	23.36	2.34	1.16	.73	58.41
Yellow Jessamine	8.00	.09	56.56	5.09	2.53	.66	141.41
Fringe tree	3.50	.05	81.43	4.07	2.03	.37	203.57

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TABLE X

RESULTS OF BROWSE SURVEY ON THE CATAHOULA NATIONAL WILDLIFE PRESERVE — MARCH 1955

(Based on 401 Sample Plots Including Samples from Both Open Range and Stock Free Area).

Browse Species	Percent of Plots Present	Average Density	Average Degree of Browsing	Utilization Factor	Percent of Food Eaten	Percent of Browse Available	Browse Index
Arrowhead	2.49	.03	3.80	.11	.07	.36	9.50
Azalea	1.99	.03	2.63	.08	.06	.36	6.56
Blackberry	29.68	.36	25.69	9.25	6.48	4.36	64.22
Blackgum	32.67	.48	7.54	3.62	2.54	5.82	21.86
Pine	4.74	.06	5.84	.35	.25	.73	14.61
Fl. Dogwood	17.21	.18	9.49	1.71	1.20	2.10	23.73
Fr. Mulberry	26.68	.38	10.19	3.87	2.71	4.61	25.47
Grape	13.22	21	1.02	.21	15	2.55	2.55
Green Ash	2.74	03	13.36	40	28	.36	33.41
Greenbrier	64.34	1.29	51.14	65.97	46.22	15.64	127.86
Hawthorn	33.17	.50	12.76	6.38	4.47	6.06	31.90
Huckleberry	54.61	1.50	6.19	9.29	6.51	18.18	15.47
Winged Sumac	13.22	.18	24.94	4.49	3.15	2.18	62.36
Red Maple	18.95	21	5.45	1.14	80	2.55	13.62
Red Cedar	1.00	.01	77.50	.78	.55	.12	193.75
Possumhaw Vib.	10.22	.14	5.95	.83	.58	1.70	14.88
Rattan	4.24	04	10.35	.41	.29	.48	25.88
Sassafras	4.74	.06	7.79	.47	.33	.73	19.47
St. Andrews Cr.	31.42	.33	30.52	10.07	7.06	4.00	76.29
Sweetgum	48.38	.86	3.34	2.87	2.01	10.42	8.35
Sweetleaf	19.45	.37	22.55	8.34	5.84	4.48	56.38
Water Oak	14.71	.15	20.17	3.03	2.12	1.82	50.42
Wax Myrtle	20.20	.39	7.01	2.73	1.91	4.73	17.53
Witchhazel	14.46	.21	2.74	.58	0.41	2.55	6.85
Yellow Jessamine	11.72	.23	24.36	5.60	3.92	2.79	60.90
Fringe tree	2.24	.02	7.22	14	1.00	.24	18.06

TABLE XI

RESULTS OF DEER BROWSE SURVEY ON THE CATAHOULA NATIONAL WILDLIFE PRESERVE — MARCH 1955

Based on 108 Plots Taken in Stock Free Area

Browse Species	Percent of Plots Present	Average Density	Average Degree of Browsing	Utilization Factor	Percent of Food Eaten	Percent of Browse Available	Browse Index
Azalea	2.78	.05	......	....	....	.92	0.00
Blackberry	2.407	.31	18.31	5.68	5.22	5.73	45.77
Blackgum	8.33	.08	17.89	1.43	1.31	1.48	44.72
Pine	6.48	.08	12.71	1.02	.94	1.48	31.79
Fl. Dogwood	4.63	.06	25.20	1.51	1.39	1.11	63.00
Fr. Mulberry	15.74	.19	22.00	4.18	3.84	3.51	55.00
Grape	8.33	.20	.33	.07	.06	3.70	.83
Greenbrier	63.89	1.00	53.48	53.48	49.15	18.48	133.70
Hawthorn	33.33	.48	11.33	5.33	4.90	8.69	28.33
Huckleberry	46.30	1.10	8.92	8.71	8.01	20.33	19.80
Winged Sumac	1.85	.03	20.00	.60	.55	.55	50.00
Red Maple	2.78	.03	8.33	.25	.23	.55	20.83
Possumhaw Vib.	5.56	.06	5.17	.31	.28	1.11	12.92
Sassafras	.93	.01	20.00	.20	18	.18	50.00
St. Andrews Cr.	34.26	.36	24.46	8.81	8.10	6.65	61.15
Sweetgum	38.89	.60	3.81	2.29	2.10	11.09	9.52
Sweetleaf	10.19	.17	28.73	4.88	4.49	3.14	71.82
Water Oak	3.70	.04	18.75	.75	.69	.74	46.88
Wax Myrtle	23.15	.43	13.52	5.81	5.34	7.95	33.80
Witchhazel	2.78	.04	.67	.03	.03	.74	1.67
Yellow Jessamine	10.19	.10	34.55	3.46	3.18	1.85	86.36

TABLE XII

RESULTS OF DEER BROWSE SURVEY ON THE CATAHOULA NATIONAL WILDLIFE PRESERVE — MARCH 1955

Based on 293 Sample Plots Taken on Open Range.

Browse Species	Percent of Plots Present	Average Density	Average Degree of Browsing	Utilization Factor	Percent of Food Eaten	Percent of Browse Available	Browse Index
Arrowwood	3.41	.04	3.80	.15	.10	.43	9.50
Azalea	.17	.02	4.20	.08	.05	.21	10.41
Blackberry	31.74	.38	27 22	10.34	7.02	4.06	68.38
Pine	4 10	.05	1.83	.09	.06	.53	4.58
Fl. Dogwood	21.84	.27	8 27	2.23	1.51	2.88	20.66
Fr. Mulberry	30.72	45	7.84	3.53	2.40	4.80	19.61
Grape	15.02	.22	.93	.20	.14	2.35	33.41
Greenbrier	64 51	1 40	50.50	70.70	48.00	1.494	126.26
Hawthorn	33 11	.51	13 29	6.78	4.60	5.44	33.22
Huckleberry	54 95	1 65	5 96	9.83	6 67	17.61	14.89
Winged Sumac	35.84	.23	12.21	2.81	1.91	2.45	30.52
Maple	24 91	28	5 33	1.49	1.01	2 99	13.32
Pos. Viburnum	11.95	.17	6 09	1.04	.71	1.81	15.21
Rattan vine	5 80	.06	10 35	.62	.42	64	25.88
Sassafras	6 14	.08	7 11	.57	.30	.85	17.78
St. Andrews Cr.	48.81	.35	20 49	7.17	4.87	3.74	51.22
Sweetgum	51.88	.95	3 21	3.05	2.07	10.14	8.03
Sweetleaf	22.87	.44	21.54	9.48	6.44	4.70	53.84
Water Oak	18 77	.19	20 27	3 85	2 61	2.03	50.68
Witchhazel	18 77	28	2 85	.80	.54	2.99	7.14
Yellow Jessamine	12.29	28	21 25	5.95	4.04	2.99	53.13
Fringe tree	3.07	03	7 22	.22	.15	.32	18.06

Work Plan I — Job No. 5

Deer Browse Survey (Aldous Method)

Consult Table XIII for comparison of browse available as the percent of food eaten for the period 1951 through 1955.

An illustrated graph (Diagram V) shows that the percent of food eaten has steadily increased from 1951 to 1955. This graph is based on the following plants:

1 Blackberry
2 Blackgum
3 Flowering dogwood
4 French Mulberry
5 Greenbrier
6 Sumac
7 St. Andrew's Cross
8 Sweetleaf
9 Water oak
10 Yellow jessamine

The percent of food eaten increased 40 percent from 1951 to 1955. It is noticeable that the per cent of available browse also increased in 1954. As a bumper acorn mast crop was evidenced in the year 1953-54, it is thought that this available food alleviated the browse situation. If this be the case, then it is reasonable to assume that some species of plants had an opportunity to recuperate, thereby furnishing more available browse than had been experienced in the past.

Work Plan I — Job No. 6

Deer Browse Survey in Madison and Tensas Parishes

A browse survey was conducted in Madison and Tensas parishes as scheduled. Concordia parish, the adjoining parish, was used as a control. In addition to these scheduled surveys, a browse survey was conducted on the Caldwell Game Management Area, which was set up for deer but is now heavily laden with cattle.

Thirteen species of plants, with blackberry, greenbrier, hackberry and water oak furnishing the bulk of the browse, was found to have been browsed on the Concordia

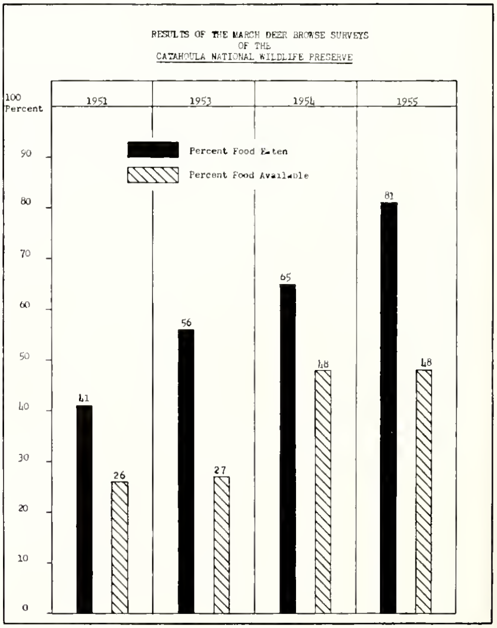


DIAGRAM V

TABLE XIII

PERCENTAGE FOOD EATEN AS COMPARED TO PERCENTAGE FOOD AVAILABLE ON THE CATAHOULA NATIONAL WILDLIFE PRESERVE

Species	1951		1953		1954		1955	
	Percent of Food Eaten	Percent of Browse Available	Percent of Food Eaten	Percent of Browse Available	Percent of Food Eaten	Percent of Browse Available	Percent of Food Eaten	Percent of Browse Available
Azalea		1 00	10	.50	04	30	06	36
Alder		05						
Blackberry	2	6 00	2 90	1 70	3 29	6 02	6 48	4.36
Blackgum	7	2 28	1 60	2 40	6 70	5 30	2.54	5.82
Fl. Dogwood	1 6	1 79	20	90	1 01	1 64	1.20	2.18
Fr. Mulberry	1 6	3 00	1 20	2 40	2 84	6 82	2 71	4 61
Greenbrier	21 0	5 00	40 40	9 60	20 92	13 70	46 22	15.64
Hawthorn	12 2	23 00	3 80	6 60	3 90	5 90	4 47	6 06
Huckleberry	35 2	23 00	40 90	47.20	12 58	20.11	6 51	18 18
Red Maple	2 9	17 00	1 40	2 10	1 01	1 43	80	2 55
Sumac	6	10			2 17	1 73	3 15	2.18
St. Andrews Cr.	3	80	1 60	.60	11 03	4 17	7 06	4 00
Sweetleaf	14 3	7.00	6 20	8 90	14 82	5 69	5 84	4 48
Sweetgum	.89	8.00	2.30	8.30	2 70	9 44	2.01	10 42
Water Oak	0	.05	07	.10	.59	1.94	2.12	1 82
Wax Myrtle	.2	3 00	.40	1.80	4 96	8 26	1 91	4 73
Yellow Jessamine	.9	.40	.20	30	57	1 26	3.92	2.79
Redbay				.01				
Witchhazel				1 10	1 20	.51	41	2.55
Fringe Tree				.50	3 57	.47	1 00	.24
American Holly			.10	.70				
Rattan Vine			1 40	3 80			.29	.48
Arrowwood					.59	.47	.07	.36
Sassafras					1 06	.38	.33	.73
Pos. Viburnum					.77	0 92	.58	1 70
Va. Willow					0			
Grape					82	1.10	15	2 55
Silverbell					02	.01		
Greenash					2 78	.01	.28	.36
Pine							.25	.73
Red Cedar							.55	12

TABLE XIV

RESULTS OF DEER BROWSE SURVEY IN CONCORDIA PARISH

March 1955

Browse Species	Percent of Plots Present	Average Density	Average Degree of Browsing	Utilization Factor	Percent of Food Eaten	Percent of Browse Available	Browse Index
Blackberry	30.86	1.70	8 20	13 94	7 17	4 02	20.50
Buttonbush	.62	.03				07	.00
Box Elder	1.85	.06				14	.00
Elm	48 77	2 06	2.81	5 79	2 98	4 87	7.03
Greenbrier	56 79	3.55	17.85	63 37	32 61	8 39	44 63
Dogwood	3 70	.11	5 00	.55	.28	26	12.50
Green Ash	41 98	1 21	.46	.56	29	2 86	1.15
Hackberry	35 80	1 38	21.29	29.38	15 12	3 26	53 23
Honey Locust	.62	.01				02	.00
Maple	3.70	09	8.33	.75	39	.21	20 83
Overcup Oak	3 09	08				.19	.00
Palmetto	70 99	17 28				40 86	.00
Rattan	56 79	2 04	4 77	9 73	5 01	4 82	11 93
Swamp Privet	11.73	.50	6 05	3.03	1.56	1 18	15 13
Sweetgum	31.48	1 65	1.67	2.76	1 42	3.90	4 18
Water Oak	50.62	3.77	13.37	50.41	25.94	8.91	33.43
Vetch	48.77	1.30				3.07	.00
Hawthorn	66.05	4 68	1.22	5.71	2.94	11.07	3.05
Buckvine	15.43	.76	10.96	8.33	4.29	1.80	27.40
Grape	1.23	.03				.07	.00

TABLE XV

RESULT OF DEER BROWSE SURVEY IN MADISON PARISH BASED ON 95 PLOTS

March 1955

Browse Species	Percent of Plots Present	Average Density	Average Degree of Browsing	Utilization Factor	Percent of Food Eaten	Percent of Browse Available	Browse Index
Blackberry	40.00	1.28	19.08	24.42	4.54	5.05	47.70
Elm	11.58	.32	.46	.15	.03	1.26	1.14
Hackberry	56.84	1.32	14.35	18.94	3.52	5.21	35.88
Rattan	46.32	1.04	18.75	19.50	3.62	4.10	46.88
Sweetgum	33.68	1.35	6.72	9.07	1.69	5.33	16.80
Hawthorn	69.46	3.56	.99	3.52	.65	14.05	2.46
Box Elder	11.06	.02				.08	.00
Greenbrier	81.05	6.19	44.68	276.57	51.38	24.43	111.69
Honeysuckle	13.68	2.06	35.39	72.90	13.54	8.13	88.46
St. Andrews Cr.	4.21	.11	57.50	6.32	1.17	.43	143.75
Water Oak	22.11	.63	14.76	9.30	1.73	2.49	36.91
Buckvine	11.58	.23	16.82	3.87	.72	.91	42.05
Dogwood	25.26	.57	45.00	25.65	4.77	2.25	112.50
Green Ash	14.74	.33				1.30	.00
Palmetto	36.84	4.32	7.43	32.10	5.96	17.05	18.57
Switch Cane	17.89	1.13	31.77	35.90	6.67	4.46	79.41
Vetch	45.26	.88				3.47	.00

TABLE XVI

RESULTS OF DEER BROWSE SURVEY IN TENSAS PARISH

March 1955

Browse Species	Percent of Plots Present	Average Density	Average Degree of Browsing	Utilization Factor	Percent of Food Eaten	Percent of Browse Available	Browse Index
Blackberry	73.15	2.99	23.92	71.52	26.48	8.54	59.81
Dogwood	44.44	1.92	42.40	81.41	30.14	5.48	105.99
Elm	2.78	.06	1.67	.10	.04	.17	4.17
Greenbrier	45.37	1.91	35.82	68.42	25.33	5.46	89.54
Green Ash	21.30	.51	1.96	1.00	.17	1.46	4.89
Hackberry	8.33	.17	2.78	.47	.17	.49	6.94
Maple	3.70	.06				.17	.00
Palmetto	84.26	23.57				67.32	.00
Rattan	24.07	.86	21.15	18.19	6.73	2.46	52.89
St. Andrews Cr.	3.70	.07	10.00	.70	.26	.20	25.00
Swamp Privet	1.85	.04				.11	.00
Sweetgum	38.89	1.24	11.67	14.47	5.36	3.54	29.17
Water Oak	11.11	.22	40.42	8.89	3.29	.63	101.04
Vetch	18.52	.40				1.14	.00
Hawthorn	40.74	.99	5.00	4.95	1.83	2.83	12.50

area. (See Table XIV) None of the plants in the samples showed an excessive browse index. Greenbrier is out of balance, with the percent food eaten column comprising 32.61, as compared to the percent of available browse which is 8.39. Blackberry, greenbrier, hackberry, and water oak furnished 80.84 percent of the total food eaten, as determined from this survey.

Seventeen species of plants were found to have been browsed in the Madison parish survey. Of these 17 plants, greenbrier, St. Andrew's Cross, and dogwood had a browse index in excess of 100. (See Table XV). The average density of the plants on this area was considerably lower than the average density in the Concordia survey. This survey was conducted for the most part in stock free range. There was a remarkable difference in the plant densities on stock free areas as opposed to those areas where cattle were present.

Only 11 species of plants were found to have been browsed in the Tensas parish browse survey. (See Table XVI). Two plants, dogwood and water oak, had a browse index in excess of 100. Surprisingly as it may seem, maple was not browsed. However, it was present in a very small percentage.

Work Plan I — Job No. 6

Deer Browse Survey in Madison and Tensas Parishes

The browse survey on the Caldwell Game Management Area was similar to that of last year. Twelve species of plants were found to have been browsed, but the average density on all of these plants was comparatively low. All plants browsed had an index in excess of 100. (See Table XVII). The two plants with the highest browse index were dogwood and water oak with an index of 250 and 205 respectively. This range has been completely destroyed as far as deer are concerned, and would not even carry the cattle that are on it if it were not for the fact that the cattle are hand fed by the owners. After an examination of the area, it would be surprising if any type of game could be carried on it. In addition to cattle and hogs, goats are now inhabiting the area.

Work Plan I — Job No. 7

Vegetation Check in Exclosures and Controls

The exclosures and controls on Red Dirt and Catahoula were checked for species, number and height class of plants present in the study plots.

These work sheets are on file, and when sufficient information has been gained for comparison purposes, results will be included in the report. No significant difference has been recorded thus far.

Work Plan I — Job No. 8

Range Studies

The exclosures on the Caldwell Game Management Area were run in April 1955. Five check plots, one mill acre in size, were established both inside and outside of the exclosures. The vegetation was recorded by species and height class in all study plots. The exclosures consisted of three one-acre plots fenced against cows but permitting usage by deer and hogs, three one-acre plots fenced against cows and hogs, but permitting usage by deer, and 2 one-acre plots fenced against deer, cattle and hogs.

These areas were fenced in February 1954. Exclosure A-2 was broken into by cattle in October and was open to grazing for an eight week period.

As would be expected, the greatest variation between vegetation composition in the exclosures and controls occurred in that area fenced against hogs, cattle and deer. There was only a difference of 19 stems in favor of the exclosures over controls in the cow- and hog-proof plots. The plots fenced against cows only had eight more stems present in the control area than was found within the exclosure.

It is interesting to note that plants over two feet in height were more prevalent in the exclosures than in the controls. (See Tables XVIII, XIX and XX for a more detailed breakdown of vegetation composition). What few deer are left on the area are reportedly using the available exclosures heavily.

TABLE XVII

RESULTS OF DEER BROWSE SURVEY ON THE CALDWELL GAME MANAGEMENT AREA

March 1955

Browse Species	Percent of Plots Present	Average Density	Average Degree of Browsing	Utilization Factor	Percent of Food Eaten	Percent of Browse Available	Browse Index
Blackberry	1.85	.04	40.00	1.60	.50	.77	100.00
Dogwood	.93	.02	100.00	2.00	.63	.39	250.00
Elm	10.19	.29	73.73	21.09	6.62	5.59	181.82
Greenbrier	3.70	.10	63.75	6.38	2.00	1.93	159.38
Hackberry	5.56	.11	55.83	6.14	1.93	2.12	139.58
Honey Locust	2.78	.06	66.67	4.00	1.26	1.16	166.67
Overcup Oak	1.85	.04	40.00	1.60	.50	.77	100.00
Rattan	56.48	1.73	61.23	105.93	33.25	33.33	153.07
Swamp Privet	25.93	.63	67.14	42.30	13.28	12.14	167.86
Water Oak	8.33	.17	81.67	13.88	4.36	3.28	204.17
Vetch	4.63	.09				1.77	.00
Hawthorn	54.63	1.91	59.51	113.66	35.68	36.80	148.77

TABLE XVIII

RESULTS OF EXCLOSURES AND CONTROLS OF THREE COW PROOF STUDY PLOTS ON CALDWELL GAME MANAGEMENT AREA

April 1955

Species	Exclosure Ht. Class in Feet		Control Ht. Class in Feet	
	0–2	2–4.5	0–2	2–4.5
Hawthorn	49	5	55	1
Persimmon	4	0	1	0
Grape	0	0	1	0
Rattan Vine	8	2	10	0
Green Ash	8	1	5	0
Blackberry	1	0	0	0
Greenbrier	0	0	5	0
Elm	0	0	1	1

TABLE XIX

RESULTS OF EXCLOSURES AND CONTROLS ON TWO COW-HOG AND DEER PROOF STUDY PLOTS ON CALDWELL GAME MANAGEMENT AREA

April 1955

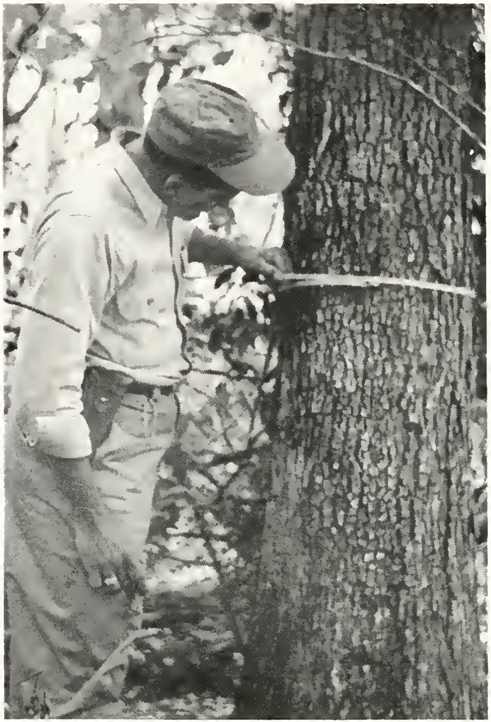
Species	Exclosure Ht. Class in Feet		Control Ht. Class in Feet	
	0–2	2–4.5	0–2	2–4.5
Hawthorn	119	5	31	4
Elm	24	0	16	1
Persimmon	3	0	1	0
Green Ash	1	0	0	0
Rattan Vine	7	0	19	0
Loblolly Pine	1	0	0	0
Honey Locust	1	0	6	0
Greenbrier	5	0	16	3
F. Dogwood	1	0	0	0
St. Andrews Cross	4	0	0	0

TABLE XX

RESULTS OF EXCLOSURES AND CONTROLS OF THREE COW AND HOG PROOF STUDY PLOTS ON CALDWELL GAME MANAGEMENT AREA

April 1955

Species	Exclosure Ht. Class in Feet		Control Ht. Class in Feet	
	0–2	2–4.5	0–2	2–4.5
Hawthorn	60	3	36	1
Elm	28	3	14	0
Persimmon	2	0	5	0
Green Ash	2	0	2	0
Rattan Vine	3	0	18	0
Honey Locust	1	0	1	0
Water Oak	0	0	1	0



Fish and Game Photos

Biologist Jack Simms makes acorn mast study

New type dove trap now in use by biologists

Work Plan I — Job No. 8

Range Studies

This is the same management area on which a browse survey showed all plants utilized to have a browse index in excess of 100.

Work Plan I — Job No. 9

General Condition of Deer Herd

A total of 263 deer was checked from various hunting clubs throughout the State during the 1954-55 deer season. This total does not include three fawn does (illegal kill) killed in Grant Parish. One fawn, aged five months, field dressed 30 pounds and the other two aged at four and 5½ months grossed 30 and 15 pounds respectively.

The average weight of legal bucks throughout the State, based on 156 deer, was 151.32 pounds.

In general, the larger antlered deer with the most points, were the heavier animals. See Table XXI for breakdown of average weight by point class and geographical location.

In the antler classification eight point bucks comprised the heaviest kill with approximately 27 percent of the kill coming in this class. Spike horn bucks made up approximately 22 percent of the total kill, followed by 6 and 4 points.

The one-and-one-half year age group was in the majority of the recorded kill by age classification, followed closely by the 2½ year age group. The oldest recorded buck was an 8 point animal with a 1 6/16 in. beam, 16¼ inch spread and field dressed 169 pounds. This deer was aged at 6½ years and came from lower Madison Parish. Only 29 of the total deer aged were found to be in excess of 2½ years.

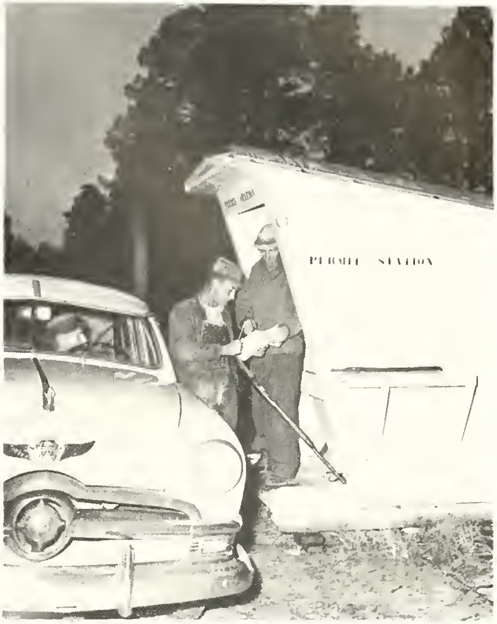
It was interesting to note that those deer in the 1½ year age group coming from Concordia Parish, the Atchafalaya bottom and lower Mississippi Delta sported 6 and 8 point antlers. In comparison, all the deer checked in the 1½ year age group from Madison and Tensas (1953-54) were only spikes.

A total of 197 deer was trapped from all areas during the past season. The breakdown on deer trapped by location is as follows:

Madision	25	10	Female	15	Male
Zemurray Park	21	8	"	13	"
*Avery Island	12	7	"	4	"
Red Dirt	139	69	"	70	"
Total	197	94		102	

*(Sex was unknown on one of the deer trapped on Avery Island.)

The majority of deer trapped were young animals. Weight on these ranged from a minimum of 35 pounds to a maximum of 135 pounds.



Hunter checks in for deer hunt on Red Dirt game management area.

TABLE XXI

AVERAGE WEIGHT IN POUNDS OF DEER KILL BY POINT CLASS AND LOCATION

Location	Spike	3 Point	4 Point	5 Point	6 Point	7 Point
Tensas and Madison	127.6	150.00	134.3	125.0	139.5	164.0
Grant-Natchitoches and Beauregard	81.3		88.8			110.0
Concordia and Catahoula	136.0	144.0	145.0	140.0	170.7	
Mississippi Delta	125.1	115.0	121.0		146.0	163.2
Union and Morehouse		90.0		113.3	114.5	
Average	117.5	124.7	122.3	126.1	142.5	145.7

Location	8 Point	9 Point	10 Point	11 Point	12 Point	18 Point
Tensas and Madison	172.5	196.3	196.6	165.0	220.0	
Grant-Natchitoches and Beauregard	132.5	138.0		148.0		
Concordia and Catahoula	199.1		191.0			165.0
Mississippi Delta	168.3	177.0	164.4	167.0	165.0	
Union and Morehouse			172.5			
Average	168.1	170.4	181.1	160.0	192.5	165.0

Deer Damage to Agriculture Crops

Studies of deer damage to agricultural crops and pasturelands is a cooperative project with the Louisiana State University Game Management Department.

Representative farms have been selected in Madison Parish and study plots set up on same.

Five individuals farms were selected. The main crops under study were soybeans, corn and cotton. One large barbed wire enclosure was erected on Olvey's farm to exclude cattle, but admit deer. Within this same enclosure, a small pen was constructed to exclude all animals. This area serves as a control.

Insufficient information was obtained on the area for any conclusions to be incorporated in this report. However, it was evidenced that soybeans produced more pods on those plants browsed by deer than on the protected plants.

Migratory Waterfowl Investigation

Richard K. Yancey, *Supervisor*

The waterfowl research study was first initiated on July 1, 1949. Since that time a great amount of information has been gathered on the status of Louisiana's waterfowl population by means of both ground and air observations. A brief resume of the findings gathered during the past two years are included in the following report:

Waterfowl Population Studies

During December of 1954-55 it was estimated that the 14 states in the Mississippi Flyway contained a population of about 7,000,000 ducks. The waterfowl population was at its peak at the time and Louisiana was holding about 19 percent of the total. Of these 7,000,000 ducks, 5,000,000 were mallards and Louisiana contained only about 10 percent at the time. The remainder were to be found largely in Illinois and Arkansas.

It was found that Louisiana is wintering most of the other puddle ducks in the flyway. On December 16, Louisiana contained 58 percent of the Pintails, 94 percent of the Green Winged Teal, 72 per cent of the Gadwalls, 18 percent of the Baldpate and 96 percent of the Shovellers found in the flyway. In spite of unusually poor habitat conditions during 1954 Louisiana wintered 54 percent of the flyway's coot population.

The Canada goose population reached its peak population during December 1954 when it was estimated that 320,000 were to be found in the flyway. At the time Louisiana contained only 1.5 percent of these geese. Of interest was the fact that Louisiana winters about 98 percent of the Blue Goose population in the flyway. During the winter of 1954 the state contained about 325,000. It was noticeable that Louisiana is wintering the only white-fronted goose population in the flyway, however, the total number found was only about 10,000.

During the past two years complete aerial waterfowl inventories have been conducted twice each month over all of Louisiana's important waterfowl areas. From these censuses a great quantity of information was obtained on the distribution, the migrations, the local movements, and the preferred habitat of each species of waterfowl wintering in the state. A considerable amount of data was also gathered on the factors that control the movements and distribution of each waterfowl species in Louisiana.

Fall, Winter and Spring 1954-55

It was interesting to observe that each species of waterfowl migrated into the state on approximately the same calendar dates noted in the past. In most cases however, the early transient Blue Winged Teal, Pintails, Green Winged Teal stopped over for only a few days, instead of weeks, before moving on due to extreme drought conditions in the coastal marshes. As a result there were no heavy population build-ups of early transients similar to those that have occurred in previous years.

The arrival of the first flocks of Blue Winged Teal were noted at Catahoula Lake on August 16. After that date small flocks continued to appear until September 10 and then the Blue Winged Teal began to arrive in large numbers. Finding conditions unsuitable, in many sections of Southwest Louisiana, due to drought most of these teal remained only a few days before migrating southward. A peak population of 77,000 was noted on October 1 but this was, of course, only a small percentage of the total number that migrated through the state.

In North Louisiana the only Blue Winged Teal population of consequence was found at Catahoula Lake although a small flock used the Prairie portion of Black Lake for a period of four weeks.

Fair numbers of Pintails, Green Winged Teal and Shovellers arrived in the state by September 15 as shown by the census table. After that date the resident populations of these species continued to build up through November. A large but undetermined number of these birds were transients and disappeared from the state in October while others remained as residents throughout the winter.

During the first half of October major flights of coots, white-fronted geese, Pintails, Green Winged Teal and Shovellers arrived in the state. In addition, minor flights of Gadwall, galdpate, Blue Winged Teal, snow, blue and Canada geese appeared. The only diving ducks noted during this period were small numbers of ring-necked ducks. Departures of Blue Winged Teal, Baldpate and Pintails occurred during the first half of October.

Nearly all of the white-fronted geese seen in early October were observed on and in the vicinity of the Lacassine National Wildlife Refuge. The chief duck concentration areas were the Audubon Refuge, the marsh area north of the Intracoastal Canal in Southwest Louisiana, the Yellow Cotton Bay marshes and at Catahoula Lake. Scattered flocks of Pintails were found in nearly every flooded rice field in Southwest Louisiana. North Louisiana stopped only a few ducks during this period and these were observed largely in the Prairie section of Black Lake.

The movement of blue and snow geese into the state was right on schedule with small numbers appearing between October 15 and 20 and the heavy flight occurring between October 26 and November 3. Nearly all of these geese proceeded directly to the coastal marshes although small numbers stopped over temporarily at Catahoula Lake and on the Mississippi River sand bars. Approximately 150,000 blue and snow geese used the eastern half of the Mississippi River Delta during November; by far the greatest number seen there in four years of inventory work. The complete absence of juvenile blue geese in Louisiana indicates that the breeding season for these birds was a failure during 1954.

TABLE NO. 1
LOUISIANA WATERFOWL INVENTORY DATA
September 15, 1954 — March 1955

Date	Pintail	Mallard	Baldpate	Shoveller	Gadwall	Blue-Winged Teal	Green-Winged Teal	Black and Mottled Ducks	Scaup	Ring-Necked Ducks	Canvasback	Mergansers	Ruddy Ducks	Wood Ducks	Fulvous Tree Ducks	Total Ducks	Coots	Blue and Snow Geese	Canada Geese	White-Fronted Geese	Total Geese
Sept. 15	6,000					40,000	1,700	8,400						10,000	1,200	67,300					
Oct. 1	9,000			3,000		77,500	3,400	8,400						10,000	1,000	112,300		5		225	230
Oct. 16	67,500	1,150	11,500	37,050	14,700	76,300	64,600	8,400		2,000				10,000	500	293,700	58,000	19,000	375	12,000	31,375
Nov. 3	221,000	148,000	18,000	39,000	60,000	4,000	141,000	12,000	35,500	12,000		3,500	8,000	34,000		736,000	44,000	291,700	1,700	7,200	300,600
Nov. 17	227,000	207,000	10,000	39,500	142,500	4,000	291,500	13,000	44,000	29,500	4,000	6,000	10,000	37,000		1,065,000	47,000	350,000	1,550	6,100	357,650
Dec. 4	177,000	266,000	7,500	59,000	107,500		234,000	11,500	62,000	35,000	4,000	11,000	10,000	39,000		1,023,500	50,000	350,000	4,000	6,200	360,200
Dec. 16	202,000	420,000	8,500	67,500	113,000		245,000	14,500	70,000	41,000	14,000	10,000	10,000	39,000		1,254,500	55,000	350,000	5,000	5,200	360,200
Jan. 8	155,000	488,000	12,000	55,000	127,000		293,500	11,500	115,500	33,500	5,500	6,000	11,000	37,000		1,350,500	39,000	350,000	5,000	5,000	360,000
Jan 28-Feb.1	161,000	297,000	11,500	64,000	135,000		269,000	12,000	116,000	30,000	12,500	6,000	12,000	37,000		1,163,000	45,000	350,000	6,160	7,300	363,460
March 3	104,500	192,000	22,000	53,000	74,000	14,000	130,000	4,000	62,000	24,000	4,000	1,000	10,000	35,000		729,500	33,000	270,000	5,000	5,000	280,000

*Approximately 6% are Snow geese.

TABLE NO. 2
LOUISIANA WATERFOWL INVENTORY DATA
September 2, 1955 — January 2, 1956

Date	Pintail	Mallard	Baldpate	Shoveller	Gadwall	Blue-Winged Teal	Green-Winged Teal	Black and Mottled Ducks	Scaup	Ring-Necked Ducks	Canvasback	Mergansers	Ruddy Ducks	Wood Ducks	Fulvous Tree Ducks	Total Ducks	Coots	Blue and Snow Geese	Canada Geese	White-Fronted Geese	Total Geese
Sept. 2	3,000					55,000		13,000						32,000		103,000					
Sept. 16-20	11,000					106,000		13,000						32,000	1,000	163,000					
Sept. 29-30	12,000		1,000			153,000		13,000						32,000	1,000	212,000					
Oct. 14-18	81,000		47,000	18,000	1,000	233,000	9,000	13,000						32,000	1,000	435,000	114,000	28,000	500	5,100	33,600
Nov. 1-3	244,000	103,000	124,000	46,000	223,000	11,000	155,000	13,000	29,000	6,000	2,000		1,000	51,000	1,000	1,010,000	318,000	329,000	1,700	10,200	340,900
Nov. 15-17	268,000	367,000	84,000	61,000	241,000		245,000	18,000	224,000	23,000	13,000			49,000		1,610,000	122,000	421,000	3,400	10,200	434,600
Dec. 5-6	317,000	528,000	53,000	54,000	245,000		438,000	18,000	229,000	29,000	26,000		18,000	47,000		2,005,000	115,000	410,000	5,500	12,200	427,700
Dec. 19-21	367,000	548,000	42,000	51,000	249,000	6,000	397,000	19,000	246,000	40,000	38,000	9,000	22,000	54,000		2,092,000	107,000	410,000	6,600	12,200	428,800
Jan. 2-4	427,000	583,000	54,000	61,000	275,000	4,000	541,000	20,000	272,000	40,000	40,000	8,000	23,000	54,000		2,406,000	114,000	410,000	7,100	12,200	429,300

During the last half of October little change in the status of the duck population occurred until October 28 when a cold front accompanied by rain and fog arrived. At that time heavy flights of Pintail, Mallards, Green Winged Teal, Gadwall, scaup and blue geese began to arrive in the state. At the same time practically all of the Blue Winged Teal and large numbers of coots departed for points south.

Following a pattern perhaps established over the centuries these flights arrived as they always had between October 28 and November 3 and dispersed in a helter-skelter fashion over every available marsh, pond, lake, slough, and river in Louisiana. Concerned only about a resting place they quietly settled down before beginning the search for a satisfactory feeding ground.

By that time, with flights still pouring in from the north, it was 12 noon on November 1 and a barrage of gunfire from 80,000 shotguns over the state suddenly lifted most of the 1,000,000 ducks and geese with a roar. In the confusion large numbers of young ducks settled back down towards the many clusters of objects that resembled their own kind, toward the loud calling that was erupting from every blind, pit and boat. As the flocks wheeled and turned guns began to reach out from 50 to 125 yards away and a few ducks fell off on one wing and began to glide away in search of cover to hide while they either recuperated or died from being crippled by "out of range" shooting. As the afternoon wore on the young birds sought out the old ducks that had quickly settled into the nearest refuge or undisturbed area for the day. During the night the ducks moved out from refuges to feed and with the poor light of first morning they were met by a hail of "in range" shot. This time many ducks began to drop from the air like stones while the survivors moved rapidly back to the nearest refuge for the day. The second morning was a duplication of the first, but after that the ducks learned to quickly move to their respective rest areas each morning before daylight and stay there until the night before moving out to feed again. For the next 22 days the ducks maintained this schedule and it was only during odd periods of bad weather that they seemed to fly all day or on days that new migrants appeared that good hunting was to be had.

The first half of the split hunting season ended on November 25 and within five days, with the respite from gun pressure, the refuge hordes begin to use the feeding grounds during the daytime also and their numbers were soon bolstered by the arrival of one-half million new migrant Mallards, Pintails, Gadwalls and diving ducks from the north. The hunting season opened again on December 17 and the duck population again re-shuffled its pattern of local movements in a fashion identical to that established during the November hunting season.

The chief waterfowl concentration areas over the state during late December were as follows:

I. North Louisiana
    1—Coulee Refuge (Mallards) (daytime)
    2—Wham Brake (Mallards) (night)
    3—Mississippi River—Flooded Mud Flats at night (Mallards, Gadwalls, Green Winged Teal, ring-necked ducks)—Resting middle of river during the daytime.

II. Central Louisiana
    1—Catahoula Lake (Pintails, Mallards) (Refuge-daytime) (flooded chufa flats at night)
    2—Sunk, Grassy, Cross lake (Mallards) (secluded regions)

III. S. W. Louisiana
    1—White Lake Marshes (Mallards, Pintails, Canada Geese)
    2—Lacassine Nat'l Wildlife Refuge (Mallards, Pintails, Green Winged Teal, White-fronted Geese, Canada Geese, Ring-necked Ducks) (daytime)
    3—Rice Fields (Mallards, Pintails) (At night)
    4—Rockefeller Refuge and environs (Green Winged Teal, Shoveller, Gadwall, Blue and Snow Geese) (day and night)
    5—Audubon Refuge (Green Winged Teal, Shovellers, Mallards, Pintails, Gadwalls)
    6—Marsh Island (Blue Geese, 5% Snow Geese)
    7—East Cove-Sabine (Green Winged Teal, Gadwall, Shovellers)
    8—Gum Cove and environs (Canada Geese, few Mallards and Pintails, Gadwalls)

IV. S. E. Louisiana
    1—Mississippi River Delta (Blue, 5% Snow Geese, Gadwall, Mallard, Pintail, Scaup, Canvasbacks)
    2—Lake Borgne Marshes (Mallards, Gadwalls)
    3—Avoca Marshes-Morgan City (Gadwalls, Green Winged Teal)
    4—Point Aufer (Mallards, Blue Geese)

Following the closing day of hunting season on January 10 the ducks again scattered from the refuges to the feeding grounds as soon as the hunting pressure was ended. Many people who saw these ducks appear on their hunting areas thought new flights of ducks had arrived in Louisiana but it was, of course, only a dispersal of refuge concentrations.

In late January, some Pintails, Mallards and Green Winged Teal were beginning to disappear to the north to start the spring migration. Large numbers followed in February but it was March before the Gadwalls, Shovellers, Baldpates, and diving ducks began to follow in quantity. March as always was the month of great waterfowl activity on the marshes, rice fields, lakes, rivers and sloughs as both wintering ducks and geese were leaving for the north while transient Blue Winged Teal, Gadwall, Shovellers and Green Winged Teal were appearing from the south. As the spring progressed well into April only remnant flocks of ducks remained and large flights of Blue Winged Teal continued to pour into the state from the South. It was well into May before the last of the Blue Winged Teal disappeared to the north.

The chief factors that influence the distribution of ducks and geese over the state during the winter were food availability and shooting pressure. To a certain degree weather influenced the local movements of ducks and geese each day. It was readily noticeable that the various species first selected their most preferred feeding ground and used it until the hunting season opened. With the application of extensive shooting pressure the ducks quickly sought out the nearest refuge or rest area for daytime use while continuing to use the preferred feeding ground at night.

The arrival and distribution of waterfowl during the fall and winter of 1955 was similar in nature to that of 1954. However, waterfowl habitat conditions were much better during 1955 and consequently the state wintered many more ducks and detained the transient populations of Blue Winged Teal, Baldpate, Green Winged Teal, Pintails, and coots for a much longer period of time. (See census tables).

In Southwest Louisiana, for example, the marshes went partially dry during the early summer long enough for vast stands of wild millet to germinate and begin to grow. As the summer progressed heavy rains flooded the marshes and the pond areas produced dense stands of aquatic vegetation such as widgeon grass while the millet continued to grow to maturity. As a result of this Southwest Louisiana, which normally winters about 65 percent of the ducks found in the state, was in perfect condition for attracting and holding a large wintering waterfowl population. The results of this condition can be readily noted in the census tables.

In regard to blue geese during 1955 it was noticeable that the flocks contained a predominance of juveniles. A good nesting season plus the fact that all of the blue geese that returned to the nesting grounds during the spring of 1955 were adults was primarily responsible for the high ratio of young to adults. The distribution of blue geese was similar to that for 1954 in Southwest Louisiana. In Southeast Louisiana a great concentration of about 215,000 blue geese were found at the mouth of the Mississippi River. During late December these geese largely dispersed into the marsh areas around Delacroix. Wintering flocks of blue geese were also found near Lake Decade in Terrebonne Parish and at Point-Au-Fer.

Waterfowl Hunter Kill Surveys 1954-55

For the first time Louisiana used a split waterfowl hunting season. The first half started on November 1 and ended November 25, 1954, the second half started on December 17 and ended on January 10, 1955. During the 50-day season a total of 11,976 hunter bag checks were made in the field by employees of the Fish and Game Division. As shown in the attached table 7,425 bag checks were made in the first half of the season and 4,551 checks were made during the last 25-day period. The average daily hunter success for ducks was 1.17 in the first half and 1.32 in the second half for a season average of 1.23. In comparing those figures with past hunter kill data this was by far the poorest hunting season that Louisiana has had since the bag check work was first started five years ago. The closed season on wood ducks reduced the success figure by six per cent or seven per cent but it was still far below the average kill of 1.5 ducks per man per day of past years.

The new low in hunter success was not a reflection of a drop in Louisiana waterfowl population since the state wintered as many or more ducks during the winter of 1954 as it had in four years. Since weather and food availability were similar in nature to that of previous years the reason for the drop in hunter success was partially undetermined. The waterfowl population as a whole is apparently becoming more and more responsive to the protection of Louisiana's network of vast refuges. During the hunting season the waterfowl distribution is distinctly controlled by shooting pressure and this is readily apparent during each inventory flight. Within a matter of hours after the shooting starts fully 85 per cent of the duck population moves into the refuges. Except during periods of bad weather or other odd circumstances the ducks continue to use the refuges during the daylight hours for the remainder of the hunting season while feeding out only at night.

TABLE NO. 3

WATERFOWL HUNTER BAG CHECKS
STATE OF LOUISIANA

November 1-25, 1954 — December 17, 1954 — January 10, 1955

	State-wide Totals	N. W. La.	N. E. La.	Central La.	S. W. La.	S. E. La.
No. Bag Checks	11,976	1,609	2,477	939	4,381	2,570
No. Ducks Checked	14,737	1,838	2,062	818	6,177	3,842
Average Ducks Killed man day	1 23	1 13	83	87	1 4	1 45
No. Geese Checked	1,331	3	18	22	1,246	42
Average Goose Killed man day	11	001	007	023	28	016
No. Ducks and Geese Checked	16,068	1,841	2,070	840	7,123	3,885
Average Duck and Goose Kill man day	1 34	1 14	83	89	1 6	1 51
No. Coots Checked.	7,628	61	56	19	28	7,464
Average Coot Kill man day	63	04	02	02	006	2 9
Total No. Ducks, Geese and Coots Checked	23,696	1,902	2,126	859	7,451	11,348
Total Waterfowl Kill man day	1 98	1 18	85	91	1 7	4 4

TABLE NO. 4

WATERFOWL KILL COMPOSITION
STATE OF LOUISIANA

November 1-25, 1954 — December 17, 1954 — January 10, 1955

Species	State-wide	N. W. La.	N. E. La.	Central La.	S. W. La.	S. E. La.
Mallard	45.0	35 7	83 36	45 84	46 98	20 3
G. W. Teal	10 4	5.93	5 28	3.42	12 3	12 4
Gadwall	8 6	3 1	72	1 2	5 14	21 63
Scaup	6 3	10 7	29	2 32	1 0	16 44
Pintail	7 2	7 83	1 3	40 8	5 99	5 0
Ring Neck	3 3	21 5	4 12	12	.21	1 95
B. W. Teal	3 0	9 0	1 6	85	2 26	2 3
Shoveller	4 9	.76	1 1	85	9 5	1 95
Baldpate	3 2	16	14	3 66	3 72	5 0
Ruddy	1 7	32	48	12	17	5 77
Black Duck	1 4	16	19	0	2 9	4
Mottled Duck	1 3	9	0	12	2 16	99
Redhead	1 0	1 25	43	.24	17	2 44
Canvasback	6	1 95	0	24	04	1 27
Merganser	9	32	29	4 15	42	1 6
Blue Goose	65 0	0	77.7	77 3	55 6	100 0
Canada Goose	4 6	0	16 6	4 5	4 0	0
Snow Goose	29 2	0	5 5	18 2	28 0	0
W. F. Goose	1 1	0	0	0	1 0	0

*11,976 Hunter Bag Checks—14,737 ducks, 1,331 geese, 7,628 coots examined in the field. Figures expressed in percentages.

TABLE NO. 5

WATERFOWL HUNTER'S BAG CHECKS
STATE OF LOUISIANA

November 1, 1954 — November 25, 1954

	State-wide Totals	N. W. La.	N. E. La.	Central La.	S. W. La.	S. E. La.
No. Bag Checks	7,425	1,042	1,338	640	2,503	1,902
No. Ducks Checked	8,717	1,252	770	359	3,747	2,589
Average Ducks Killed/man day	1.17	1.2	58	.56	1.49	1.3
No. Geese Checked.	489	0	18	22	410	39
Average Goose Killed/man day	066	0	013	034	16	02
No. Ducks and Geese Checked	9,206	1,252	778	381	3,857	2,628
Average Duck and Goose Kill man day	1.1	1.2	58	.59	1.54	1.32
No. Coots Checked.	7,153	31	34	19	27	7,042
Average Coot Kill man day.	96	029	025	029	.01	3.7
Total No. Ducks, Geese and Coots Checked	16,359	1,283	822	400	4,184	9,670
Total Waterfowl Kill man day	2.22	1.23	61	625	1.67	5.0

TABLE NO. 6

WATERFOWL HUNTER BAG CHECKS
STATE OF LOUISIANA

November 1, 1954 — November 25, 1954

Species	State-wide	N. W. La.	N. E. La.	Central La.	S. W. La.	S. E. La.
Mallard	40.1	31.0	67.0	40.9	52.1	19.1
G. W. Teal	10.4	7.4	10.0	3.3	10.8	11.6
Gadwall	9.2	3.1	2.5	1.9	5.4	20.8
Scaup	6.9	10.8	.78	5.0	1.3	15.2
Pintail	6.2	5.8	2.5	37.0	6.9	3.3
Ring Necked..	4.8	23.5	9.3	.27	.32	1.9
B. W. Teal	4.6	12.6	3.7	1.9	3.5	3.4
Shoveller	3.9	1.1	1.1	.5	6.9	2.3
Baldpate	3.4	.08	.25	7.5	3.0	6.1
Ruddy	2.7	47	1.2	.27	2	8.1
Black Duck	1.8	16	.12	0	4.0	.46
Mottled Duck	1.6	.87	0	27	2.7	.96
Rehhead....	1.2	.23	.9	.5	.27	3.2
Canvasback..	.9	2.5	0	5	.08	1.8
Mergansers	9	23	.78		.4	1.0
Blue Geese...	68.5	0	77.0	77.0	64.6	100.0
Snow Goose...	20.6	0	5.0	18.5	23.4	0
Canada Goose	4.0	0	16.0	4.5	3.9	0
W. F. Goose	1.0	0	0	0	1.2	0
Other	5.7	0	0	0	6.8	0

TABLE NO. 7

WATERFOWL HUNTER'S BAG CHECKS
STATE OF LOUISIANA

December 17, 1954 — January 10, 1955

	State-wide Totals	N. W. La.	N. E. La.	Central La.	S. W. La.	S. E. La.
No. Bag Checks	4,551	567	1,139	299	1,878	668
No. Ducks Checked	6,020	586	1,292	459	2,430	1,253
Average Ducks Killed/man day.	1.32	1.03	1.14	1.5	1.28	1.8
No. Geese Checked.	842	3	0	0	836	3
Average Goose Killed/man day.	185	.005	0	0	.45	.004
No. Ducks and Geese Checked	6,862	589	1,292	459	3,266	1,257
Average Duck and Goose Kill man/day	1.5	1.04	1.14	1.5	1.7	1.9
No. Coots Checked.	475	30	22	0	1	422
Average Coot Kill/man day..	1	.053	019	0	0	.63
Total No. Ducks, Geese and Coots Checked	7,337	619	1,314	459	3,267	1,678
Total Waterfowl Kill man day..	1.6	1.09	1.15	1.5	1.7	2.5

TABLE NO. 8

WATERFOWL KILL COMPOSITION
STATE OF LOUISIANA

December 17, 1954 — January 10, 1955

Species	State-wide	N. W. La.	N. E. La.	Central La.	S. W. La.	S. E. La.
Mallard	52.0	46.4	93.6	49.6	48.4	22.23
G. W. Teal	10.9	2.73	2.5	3.5	17.6	14.0
Gadwall	7.85	3.0	3	65	4.73	23.9
Scaup	5.2	10.4	0	.21	65	18.8
Pintail	9.3	12.1	54	44.2	4.52	8.6
Ring Necked.	2.39	17.7	1.0	0	.04	2.0
B. W. Teal	.49	1.36	.3	0	.32	.79
Shoveller	6.0	0	1.0	1.0	15.2	1.0
Baldpate	2.62	.34	07	65	4.85	2.7
Ruddy	.19	0	0	0	.08	.79
Black Duck..	.63	.17	.23	0	1.23	.32
Mottled Duck	.81	.85	0	0	1.27	1.0
Redhead	.53	3.4	.15	0	0	.79
Canvasback	.08	68	0	0	0	.07
Mergansers	.81	.5	0	0	45	2.7
Blue Goose.	61.5	0	100	100	51.2	100
Canada Goose	4.4	0	0	0	4.0	0
Snow Goose.	32.9	0	0	0	29.1	0
W. F. Goose..	.95	0	0	0	15.4	0

*4551 Hunter Bag Checks—Expressed in Percentages.

For taking a split hunting season Louisiana received a 10 per cent penalty in the number of alloted days because the kill of waterfowl was supposed to be higher in a split season. This, however, did not hold true. A total of 11,976 field bag checks were made during the two 25-day hunting seasons of 1954-55 and the average hunter's success was only 1.23 ducks per day. In previous years of 50- and 55-day straight hunting seasons the average kill has always been about 1.5 ducks per day; no change whatsoever has been made in bag check areas during this period. As stated above more ducks were present in Louisiana during the split season than have been recorded during any one of the past five years.

The chief advantage to the hunter in having a split hunting season is that after the first half closes the ducks will disperse from the refuges and scatter over the hunting areas during the respite from gun pressure. After using the hunting areas for two or three weeks in safety excellent hunting is afforded for the first two or three days of the last half of the split season before the ducks are driven back to the refuges.

The kill percentage over the state by species were similar to those of past years with Mallards comprising 50 per cent of the bag followed by Green Winged Teal 11 per cent, Pintails nine per cent, Gadwalls eight per cent, etc. As in the past the percentage composition by species of kill is much different from the composition of the total population. Mallards, ring-necked ducks and Gadwalls continue to bear the brunt of kill while the Pintails, Green Winged Teal, Blue Winged Teal and blue geese escape their share of the shooting pressure. As in the past the kill on blue geese was practically nonexistent this year.

As shown in the kill composition a considerable variation occurred in the species take over the various regions of the state and between the November and December, January hunting seasons.

For example the Mallards, made up 83.4 per cent of the total bag in Northeast Louisiana while in Southeast Louisiana it comprised only 20.3 per cent. The Mallard made up 40 per cent of the bag during the November hunting season and 52 per cent during the December, January seasons for a season average of 45 per cent.

During the winter of 1955-56 the state had a 70-day duck hunting season that extended from November 5 through January 13. An estimated 10,000 hunter bag checks were made in the field during this season but the results were not tabulated in time to include in this report.

Waterfowl Banding Operation

During the past two years extensive waterfowl trapping and banding operations have been undertaken at the Coulee Refuge near Oak Ridge and at Catahoula Lake.

Approximately 7,345 ducks have been banded at these two places during the past two years. At Catahoula Lake approximately 1,000 were banded during the winter of 1954 and approximately 820 ducks were banded during the winter of 1955. At the Coulee Refuge 1,925 Mallards were banded during the winter of 1954 and approximately 3,600 have been banded during the winter of 1955. Approximately 95 per cent of the ducks banded were Mallards.

To date 100 Mallard band recoveries have been received from the Catahoula Lake banded bucks. Of these, 24 per cent were returned by hunters from Southwest Louisiana, one per cent from Southeast Louisiana, eight per cent from Avoyelles Parish, four per cent from the vicinity of Black and Saline Lakes, three per cent from the Monroe Area, three per cent from east central Louisiana, five per cent from Arkansas, one per cent from Tennessee, three per cent from Mississippi, and the remaining 48 per cent from Catahoula Lake and vicinity. These recoveries indicate that Catahoula Lake plays an important role in providing good hunting within a radius of 25 miles of the lake. It shows that the winter dispersion of Mallards from the lake prior to January 10 is in a southerly direction into the marshes and rice fields of Southwest Louisiana. It also indicates that a number of Mallards head north from Louisiana during late December and early January to Arkansas and Mississippi.

Band recoveries from the Coulee Refuge near Oak Ridge show that this refuge is vital to hunting in the Monroe region since it serves to hold a wintering concentration of about 30,000 Mallards in the area. In this section of the state every slough, brake, lake, and even the drainage canals are heavily hunted and shooting pressure would normally drive the ducks from the entire region in a matter of hours if protection was unavailable. As it is the ducks are able to withstand the hunting efforts since they can feed out from Coulee Refuge over the hunting areas at night.

Of 107 Mallards banded and shot by hunters the same winter 77 per cent were bagged in the vicinity of the Coulee Refuge (principally at Wham Brake). Of the remainder 17 per cent were taken in Arkansas, four per cent from Mississippi, one per cent from Texas and one per cent from Central Louisiana.

Louisiana's Waterfowl Situation

The state contains nearly 6,000,000 acres of area which is used by our wintering waterfowl. Approximately 500,000 acres of this total is to be found in inviolate refuges. A total of 240,000 acres is presently being maintained by the U. S. Fish & Wildlife Service, approximately 182,000 acres are under the supervision of the Louisiana Wildlife and Fisheries Commission and approximately 26,000 acres are under the supervision of the National Audubon Society. For the most part these lands comprise some of the finest waterfowl habitat found in the state.

The state is presently managing only one public shooting ground specifically for waterfowl this being the 66,000-acre Pass-a-Loutre area at the mouth of the Mississippi River. Two additional public schooting grounds are being constructed near Monroe at this time. In addition Louisiana contains several impoundments which have been constructed by the state but are not being managed for waterfowl. These areas such as Lake Bistineau, Black and Saline Lakes, Turkey Creek, Cheniere Brake and Anacoca Lake are open to the public for duck hunting and are used to a slight degree by waterfowl. It is believed that the state contains approximately 300,000 acres of commercial waterfowl hunting areas where a fee is charged by individuals. These areas make up about 5.0 per cent of the total waterfowl habitat in the state and occupy many of the most choice duck and goose areas. Most of the commercial hunting grounds are found in Southwest Louisiana's marshes and rice fields.

It is roughly estimated that the state contains 3,500,000 acres of private hunting areas which are leased to or are owned by private individuals for their exclusive use. This includes approximately all of the coastal marsh areas in Southwest Louisiana not enclosed by a commercial area or refuge, many of the rice fields in Southwest Louisiana, much of the coastal marsh areas in Southeast Louisiana, and a small but ever increasing per cent of the up-state waterfowl habitat.

The free range or unposted areas comprise an estimated 1,150,000 acres which are used by waterfowl. This makes up about 19 per cent of the waterfowl use area in the state, but most of it is unsuitable for hunting.

During the normal winter with satisfactory habitat conditions Louisiana will winter approximately 2,000,000 ducks, 450,000 geese and 100,000 coots. It will also serve as a temporary stopping off point for an estimated 1,500,000 ducks and 300,000 coots.

From the above figures it is obvious that Louisiana is carrying an excellent supply of waterfowl through the winter for hunting purposes, that it has an ample acreage of its waterfowl habitat in refuges and other naturally secure areas, but that it has only a small percentage of the areas needed in state public shooting grounds. Since the duck hunter chiefly benefits from our wintering waterfowl it is believed that we should convert as much of our present habitat into public shooting grounds as possible, and that this can be done without in anyway creating a hazard to our waterfowl population. This statement can be made inasmuch as our ducks and geese are very sensitive to shooting pressure. Once it is applied on the opening day of hunting season the waterfowl immediately moves in mass from the hunting areas to the refuges. Within two days after the shooting starts nearly 90 per cent of the total state duck population is to be found in the refuges. From then to the closing day of hunting season they rest in the refuges during the day time and feed out over the hunting areas at night only. After this daily routine is established by the various duck populations, it is only on rare days when new flights arrive in the state or bad weather conditions persist that the hunters are able to bag any ducks. From the extensive hunter kill surveys that have been made during the past five years it is obvious that the number of ducks taken on all but the first two days are of a minor nature.

For example, on Catahoula Lake, a 21,000-acre waterfowl area in Central Louisiana, we have frequently found duck populations in excess of 300,000 using the refuge in the center of the lake while the hunters using the 500 duck blinds around the refuge were averaging a daily bag of about ½ duck per hunter per day. Here we have a high quality duck area carrying an extremely high duck population surrounded by a free range hunting area which is heavily hunted but where only a small percentage of the wintering duck population is bagged. In spite of the fact that the lake sometimes carries 300,000 ducks for weeks during the duck season our hunter bag checks indicate that the legal kill does not exceed over 15,000 to 20,000 ducks.

As stated above only about one per cent of the state's waterfowl habitat is in public shooting grounds and it is believed that this figure should be increased to at least 15 per cent or more if possible. This belief is based on the tremendous values received from our present wintering waterfowl.

From the economical viewpoint the presence of our wintering waterfowl means about $7,000,000 annually to the state. Approximately 90,000 duck hunters buy a $2.00 duck stamp each fall in Louisiana and they take about 1,000,000 waterfowl. For each duck, goose, and coot that they take home they spend about $7.00 for sporting goods (guns and shells, etc.), gasoline for transportation, lodging in hotels and motels, guide service, etc. This $7,000,000 means money in the bank to a large cross-section of businessmen over the state and this is one of the many reasons why our waterfowl hunting should be maintained on a public basis.

The recreational standpoint cannot be established in dollars and cents but its value undoubtedly far exceeds the economical value derived from waterfowl hunting. Our 90,000 duck hunters are, by and large, family head people who need an escape from the pressure of routine work and no better opportunity exists to get away from it all than to make a duck hunt.

On the average each of the 90,000 duck hunters make about seven hunts during a 60-day season. In addition they average making four check up trips prior to season for the purpose of building blinds and looking over the duck situation and this means about 1,000,000 trips afield are made in connection with waterfowl each year.

The means by which more shooting grounds may be provided are many. In other states where such a program is of primary consideration lands are being purchased outright at every opportunity. In Louisiana, however, under the present mineral rights law, it is difficult to buy large tracts of marshes regardless of how minor the surface values may be.

It is believed that our public hunting grounds can be increased by discontinuing the present practice of leasing hunting rights on state lands to certain individuals and groups. This is presently being done in such places as the Delta area at the mouth of the Mississippi River where some of the finest hunting grounds are owned by the state but are closed to the public by individuals.

By developing for waterfowl the large impoundments that have been constructed by the state, the available hunting territory could be increased materially. In certain regions such as Northwest Louisiana this offers the only potential for providing quality hunting to a large number of people. For example, by establishing a simple annual water fluctuation plan the 17,000-acre Lake Bistineau near Shreveport could be made into a fine waterfowl area. As it is now it seldom carries more than 300 ducks through the winter. The state contains about six more areas that are similar in nature to Bistineau.

In Northeast Louisiana a large number of cypress brakes and sub-marginal land areas have been drained but never developed as farming land. If these areas could be leased, they could easily be developed for attracting waterfowl and would supply a large amount of hunting opportunity in the Monroe-Bastrop region.

In the coastal marshes of South Louisiana attempts should be made to lease the hunting rights for large tracts of marsh lands. In most areas these marshes are already highly attractive to waterfowl and in nearly all cases they could be developed as fine waterfowl hunting areas.

In the rice belt of Southwest Louisiana, which feeds the bulk of the Mallards and Pintails that winter in the state, the hunting opportunity could be greatly increased by establishing a network of small refuges of 400 or 500 acres in size in the Crowley-Lake Charles-Eunice and Ville Platte areas. Normally the ducks that feed at night in this vast region shift back to the huge concentration points along the Intracoastal Canal to rest during the daytime. The establishment of a small network of refuges would tend to disperse these vast concentrations of 200,000 and 300,000 ducks through the rice fields in flocks of 30,000 to 40,000 and this would supply quality hunting for several miles around each small refuge. Other areas that offer excellent potential for development as public shooting grounds are the Atchafalaya bottoms near Krotz Springs, the Lafourche Swamp near Monroe and the Bayou Bodcau near Shreveport.

Last but definitely not least our greatest waterfowl need is for close planning with the various agencies who are engaged in drainage, flood control, or other water control works. In many cases slight alterations in planning can oftentimes prove beneficial instead of detrimental to waterfowl.

Every effort should be made to retain our better waterfowl areas in the best condition possible. Catahoula Lake, the most important single waterfowl area in the state, is continuously being threatened and it should always be retained in its natural state. Such areas as this are irreplaceable and even minor adjustments in the present fluctuation of water levels could cause it to lose its attractiveness to waterfowl. The other waterfowl factors not discussed above such as the effects of animal factors, weed problems and salt water intrusion were discussed in the Biennial Report of 1952 and 1953.

Mourning Dove Study

John D. Newsom, *Study Leader*

The Mourning Dove Segment of the Migratory Bird Study has continued through the year 1954-55 with the collection of data being delegated primarily to district personnel. Data collected are considered to be primarily for the purpose of making recommendations for seasons, bag limits, etc. A final report on this project has not been accomplished, however, it is anticipated during 1956.

The various phases of the project which have been continued are as follows: Random Road Counts, Call-Road Counts, Trapping and Banding and Hunter Bag Checks. These will be discussed separately and selected data presented in tabular form in the following pages.

Random Road Counts

Random road count data have indicated a steady increase in the dove population during the two years covered by this report and a tremendous increase in the population over that of 1952 and 1953. Of course, the increase was expected and natural since the dove population suffered a tremendous decimation during the severely cold weather of late January-early February 1951. This readily apparent and relatively rapid recovery of a severely decimated dove population should amply demonstrate the ability of the species to withstand normal pressures as exerted by the gun and natural mortalities without adversely affecting subsequent populations.

A comparison of road count data for the years 1952 through 1955 is presented in Table I. For purposes of comparison only statewide totals are given.

Call-Road Count

The call-road count, another method employed to determine trends in breeding populations of doves, has been continued and expanded during the period covered by this report. During 1954 and 1955 two call count routes have been run monthly in each of the seven districts from May through August. These data have also indicated a steady increase in the breeding dove population of Louisiana. From the data obtained it appears that the breeding season in 1955 was projected later than it normally is. On most routes there was a significant increase in the number of calling doves heard during August. It is probable that this increase is not just a direct influence of an increased population, but rather a reflection of disturbances in normal nesting activities during the peak nesting period. Table II shows call-road count data collected during 1954 and 1955.

Trapping and Banding

During this report period, 7,030 doves have been trapped, banded and released, and an additional 1,826 birds were recaptured. Returns from these bandings are

TABLE I

RANDOM ROAD COUNTS

1952-53—Month	No. Miles	Doves per 100 Miles	1954-55	No. Miles	Doves per 100 Miles
January	4,318	11.3	January	6,338	3.3
February	6,351	3.7	February	16,659	7.7
March	10,978	2.4	March	16,336	4.53
April	8,267	6.4	April	20,117	6.53
May	12,604	10.4	May	18,773	8.67
June	8,573	6.38	June	20,785	9.7
July	17,373	9.28	July	16,933	11.7
August	17,328	12.48	August	15,276	13.9
September	16,884	16.99	September	14,586	24.0
October	18,842	8.77	October	10,374	7.0
November	15,005	4.22	November	9,801	16.67
December	9,929	5.0	December	7,198	14.76
January	11,821	3.2	January	10,385	17.8
February	11,510	3.8	February	14,001	10.5
March	14,350	3.4	March	14,886	8.98
April	15,287	5.11	April	12,719	7.0
May	13,006	7.14	May	14,121	9.7
June	18,211	7.1	June	16,091	10.85
July	21,218	7.3	July	15,222	13.41
August	22,790	12.9	August	15,212	21.17
September	15,607	7.6	September	12,264	20.42
October	13,646	6.0	October	7,606	6.6
November	10,780	10.4	November	7,737	21.46
December	5,917	9.9	December	5,716	17.85

TABLE II

CALL ROAD COUNTS — 1954-1955

District	Route	Month	Doves Heard Calling		Doves Seen	
			1954	1955	1954	1955
I	Ringgold to Fryeburg	May	30	23	32	22
	Shongaloo-Leton	May	34	24	14	12
	Ringgold-Fryeburg	June	31	23	27	24
	Shongaloo-Leton	June	26	22	16	28
	Ringgold-Fryeburg	July	45	26	34	26
	Shongaloo-Leton	July	*	15	*	12
	Ringgold-Fryeburg	August	49	9	41	52
	Shongaloo-Leton	August	*	9	*	72
II	Caldwell and Ouachita Parishes	May	39	31	8	25
	S. E. Union Parish	May	0	0	7	5
	Caldwell and Ouachita Parishes	June	9	36	21	13
	S. E. Union Parish	June	8	*	18	*
	Caldwell and Ouachita Parishes	July	10	21	11	10
	S. E. Union Parish	July	8	18	17	48
	Caldwell and Ouachita Parishes	August	5	11	4	24
	S. E. Union Parish	August	2	6	18	41
III	Sabine and Natchitoches Parishes	May	29	36	6	14
	Grant	May	34	*	32	*
	Sabine and Natchitoches Parishes	June	24	45	17	14
	Grant	June	33	53	13	16
	Sabine and Natchitoches Parishes	July	16	21	22	37
	Grant	July	31	42	34	24
	Sabine and Natchitoches Parishes	August	1	*	12	*
	Grant	August	5	21	22	22
IV	Frogmore-Pecan Grove	May	31	*	43	*
	Wisner-Fort Necessity	May	37	35	39	29
	Frogmore-Pecan Grove	June	*	51-33**	*	45-47**
	Wisner-Fort Necessity	June	40	43-50**	23	38-32**
	Frogmore-Pecan Grove	July	29	*	46	*
	Wisner-Fort Necessity	July	21	44	35	27
	Frogmore-Pecan Grove	August	23	31	49	38
	Wisner-Fort Necessity	August	11	*	14	*
V	Crowley-Esterwood	May	4	4	7	6
	Camp Polk-Hayman Settlement	May	*	*	*	*
	Crowley-Esterwood	June	*	*	*	*
	Camp Polk-Hayman Settlement	June	*	38-54**	*	11-49**
	Crowley-Esterwood	July	0	2	2	4
	Camp Polk-Hayman Settlement	July	8	11	64	17
	Crowley-Esterwood	August	1	11	1	3
	Camp Polk-Hayman Settlement	August	12	*	49	*
VI	Port Allen-White Castle	May	18	12	1	8
	Livonia-Red Cross	May	17	27	3	4
	Port Allen-White Castle	June	14	12	1	0
	Livonia-Red Cross	June	27	48	2	5
	Port Allen-White Castle	July	15	*	6	*
	Livonia-Red Cross	July	25	34	2	1
	Port Allen-White Castle	August	19	5	4	2
	Livonia Red Cross	August	31	9	4	11
VII	East Baton Rouge-Iberville Parishes	May	20	*	9	*
	Near Clinton-Highways 125 and 126	May	2	2	4	2
	East Baton Rouge-Iberville Parishes	June	15	3	4	5
	Near Clinton-Highways 125 and 126	June	6	0	2	5
	East Baton Rouge-Iberville Parishes	July	2	9	5	5
	Near Clinton-Highways 125 and 126	July	9	1	4	0
	East Baton Rouge-Iberville Parishes	August	4	5	13	4
	Near Clinton-Highways 125 and 126	August	*	0	*	1
	East Baton Rouge-Iberville Parishes	September	*	1	*	3

*No count made.
**Two counts made during the same month.

too numerous to record in a report of this nature. Suffice it to say that much invaluable information with regard to migrational habits, annual population turnover and various population segments of the mourning dove have been obtained.

Band recoveries have shown essentially the same pattern of migration as demonstrated in previous reports, a widespread dispersal of doves from Louisiana in a westward direction during August and September and an apparent filtering back of this same population segment in late December-January. The statewide population is apparently complemented in late October and November by additional flights of doves from more northern areas.

Hunting Reactions

In 1954 Louisiana had its first September season on doves since 1948, with the first half of the split season opening on September 15 and the last half closing on January 10; this was repeated in 1955. With the evident increase in the dove population in 1955, an extension in length of season was granted by the U. S. Fish and Wildlife Service.

The September dove season has been enthusiastically endorsed by sportsmen from most parts of the state with the exception of one local area in South Central Louisiana. Objections to the early season have been based on the premise that many nesting doves are destroyed as a result of the parents being shot during September seasons. It is true that some nesting doves are lost in this manner, but the population dynamics of the species are such that maximum benefits to the sportsmen cannot be realized unless we have a September shooting season. In reality the total number of nesting doves lost in this manner is inconsequential insofar as the total dove population is concerned, and is definitely not reflected in future populations.

Hunter bag checks conducted in the field during the past two seasons have shown that hunter success has remained relatively constant during early and late seasons. Dove hunting has grown considerably in popularity during the past two seasons, and with a continuation of present regulations it can only continue to grow.

It is planned that a final report on the six years' work will be prepared prior to the next biennial report.

New dove trap now in use by biologists.

The present segment of the dove study will be terminated during 1956, and additional dove research inaugurated.

It is absolutely essential to continue the collection of management data currently being collected in order to properly manage the mourning dove as a game bird.

As a result of data collected on this project, it is recommended that the following hunting season framework be requested for dove hunting in Louisiana:

1. The season framework be set to run from September 1 through January 10.

2. That we be allowed to set up two zones in the state which will be delineated by the northern boundaries of the following parishes: Beauregard, Allen, Evangeline, St. Landry and Pointe Coupee.

3. That the season be set from September 1 to run consecutively for as many days as are allowed for the Northern Zone and to run back from January 10 for as many days as are allowed in the Southern Zone.

4. In the event that we are not allowed to zone the state that we have a split season on doves; the first half beginning on September 1 and the last half ending on January 10.

Woodcock Segment

Work has continued on the major phases of the woodcock investigation through studies of population density and distribution, banding and hunting reactions.

Studies of woodcock numbers are proceeding by use of dogs, hunter reports, and night feeding area census. No one method gives all the desired information but future extensive use of all three may provide an index or trend to woodcock numbers in Louisiana.

Banding of woodcock is continuing in selected areas. A total of 392 woodcocks was banded by Commission personnel during the winter of 1953-54. One hundred sixty-seven woodcock were banded during 1954 and early 1955.

Hunting reactions are being investigated through field contacts with hunters and hunter questionnaires.

A study of the correlation of earthworm abundance to woodcock abundance was completed in 1954. An analysis of the data collected indicated that the abundance of earthworms is only one of several factors that determine woodcock abundance and in itself does not assure high bird populations.

Information gathered to date indicates that breeding woodcock may be more plentiful in Louisiana than originally supposed. Only by continued field observations over many breeding seasons can enough information on this subject be gathered.

Present plans call for a continuation of the program outlined above with the possible development of a small burn technique to facilitate woodcock banding in cutover pine woods areas with low bird concentration.

Snipe Segment

The investigations of snipe abundance and distribution, snipe hunting reactions, and banding of snipe were continued during the period of this report.

Census techniques to determine the abundance and distribution of snipe are still in the development stages. An annual winter inventory was made in late January and early February over permanently established routes in 1954 and 1955 in an effort to develop a census method that would reveal trends in the snipe population. Information obtained to date does not provide reliable snipe trend data. Because of the fluidity of the species and the inaccessibility of its range (largely coastal marsh) adequate census data are extremely difficult to obtain. Further attempts will be made to develop a satisfactory method for the census of snipe—a major aim of this study.

Snipe hunting reactions were investigated by use of a hunter questionnaire and the contact of hunters in the field.

Banding of snipe has continued with 99 birds being banded by Commission personnel during the winter of 1953-54 and 20 banded in 1954 and 1955.

The number of nights in a season when snipe may be readily caught are few and the banding of these birds is difficult at best. An attempt will be made to devise trapping techniques suitable for the daytime capture of snipe.

Squirrel Investigations

J. B. Kidd, *Study Leader*

The most significant discoveries revealed by this study during the past two years concerns itself with hunter bag checks in the field, trapping and tagging, and data on age, sex ratios and breeding.

Tables I and II, show the results of bag checks in the field for the two years—1954 and 1955. It can be seen that for both years the average kill per hunting effort for all bag checks made, was 1.9 squirrels bagged. However, when the bag checks made inside the Game Management Areas, are separated from those made on outside areas, the figures throw a different light on the picture. It is believed, that kill figures from outside areas show a truer picture for the whole state than those on Game Management Areas. With this in mind, then it is easily seen that hunting was much poorer during 1955, than 1954. The average kill per hunting effort on the outside areas for 1954 and 1955 was 2.6 and 1.7 squirrels bagged per hunting effort.

The reason for this decrease in kill per hunter effort during the 1955 season is probably due to the poor mast crop in the year preceding the hunting season. And likewise, the reason for the good hunting success during the 1954 season, was the excellent mast crop of 1953.

The kill figures show an increase on the game management areas, from 1.6 in 1954, to 1.9 squirrels killed per hunting effort in 1955. This may be explained, in part, by the fact that the Catahoula G. M. A., which is a poor quality squirrel area and where more than one-half of 1954 bag checks were made on the Game Management Areas, was not opened in 1955. In its place, three areas of good squirrel hunting range (Jackson-Bienville, Grant-Rapides, and West Bay), one fair area (Union Parish G. M. A.) and one poor area (Red Dirt) were opened to 1955 hunting. Two year comparisons may be seen between Livingston Parish G. M. A., which declined in number of squirrels per hunter effort from 2.3 in 1954,

TABLE I

SQUIRREL HUNTER BAG CHECKS — 1954 SEASON

Parish or Area	No. Hunters Checked	No. Squirrels Killed			Average Kill Per Hunting Effort	Estimated Crippling Loss
		Fox	Gray	Unknown*		
Union	82	113	35	6	1.9	
Morehouse	129	193	51	0	1.9	
Beauregard-Allen-Calcasieu	22	12	7	0	.8	
St. Landry	85	145	112	17	3.2	
Iberville	10	30	7	0	3.7	
Ouachita	312	574	83	0	2.1	
Concordia	674	1,547	252	430	3.3	
Pointe Coupee	23	56	51	0	4.7	
Jackson-Bienville	132	238	266	0	4.9	
Webster	21	12	39	0	2.4	
Richland	27	39	3	0	1.6	
Bossier	203	74	107	0	.9	
Vernon	13	8	7	0	1.2	
Evangeline Game Mgt. Area	868	866	1	0	.9	
Rapides	8	8	0	0	1.0	
Livingston Game Mgt. Area	821	218	1,677	11	2.3	
Livingston	43	11	100	0	2.7	
Catahoula Game Mgt. Area	2,307	1,207	2,440	26	1.5	
Grant-Winn	93	50	155	0	2.1	
TOTALS	5,873	5,401	5,393	490	1.9	15%

Hunters checked inside game management areas—3,996.
No. Squirrels killed—6,409.
Average kill per hunting effort—1.%.
Hunters checked outside game management areas—1,877.
No. squirrels killed—4,875.
Average kill per hunting effort—2.6.
*Squirrels were skinned in the woods.

TABLE II

SQUIRREL HUNTER BAG CHECKS — 1955 SEASON

Parish or Area	No. Hunters Checked	No. Squirrels Killed			Average Kill Per Hunting Effort	Estimated Crippling Loss
		Fox	Gray	Unknown*		
Union	13	16	1	0	1.3	
Allen	8	0	10	0	1.2	
St. Landry	110	111	97	18	2.1	
Ouachita	6	8	0	0	1.3	
Concordia	765	1,082	217	8	1.7	
Pointe Coupee	128	142	95	0	1.9	
Richland	18	23	0	0	1.3	
Bossier	191	61	82	0	.7	
Evangeline Game Mgt. Area	230	248	1	0	1.1	
Livingston Game Mgt. Area	1,072	117	1,854	0	1.8	
Livingston	30	0	54	0	1.8	
Grant	106	250	0	0	2.7	
Sabine Game Mgt. Area	454	259	276	0	1.2	
Sabine	10	9	0	0	2.7	
Union Game Mgt. Area	241	92	436	0	2.2	
West Bay Game Mgt. Area	1,918	87	3,520	0	1.9	
Grant-Rapides Game Mgt. Area	2,540	5,205	76	0	2.1	
Jackson-Bienville Game Mgt. Area	1,758	939	2,578	0	2.0	
Red Dirt Game Mgt. Area	225	95	157	0	1.1	
Franklin	13	33	0	0	2.5	
TOTALS	9,836	8,777	9,454	26	1.9	10%

*Squirrels were skinned in the woods.
Hunters checked inside game management areas—8,438.
No. squirrels killed—15,940.
Average kill per hunting effort—1.9.
Hunters checked outside game management areas—1,398.
No. squirrels killed—2,317.
Average kill per hunting effort—1.7.

to 1.8 in 1955 and Evangeline Game Management Area, which increased from .9 in 1954, to 1.1 in 1955.

As has been pointed out before, the squirrel population usually fluctuates with the mast crop. A good mast year will generally result in an increasing squirrel population and vice-versa. It is not believed that hunting pressure has any effect on the relative abundance of a squirrel population. This is further substantiated by tag returns received this year, which indicate that the hunter harvest on the squirrel population is very light.

Eighteen months prior to the opening of West Bay Game Management Area, in 1955, 342 squirrels were trapped, and a metal tag was placed in the ear of each animal before it was released. When the season was opened in 1955, sixty-six of these tagged animals were killed by hunters who passed through the bag check stations. This showed a 19 per cent return by hunters. If an additional 10 per cent was added to this for tags that did not remain in the ear of the squirrel, and the few that ranged over the boundary and were killed, then the hunter harvested only about 30 per cent of the squirrels on the area. This would certainly leave an ample breeding stock for the following season. It should also be pointed out that the hunting pressure on West Bay was greatly in excess of normal hunting on the outside. If it had been subject to normal gunning, the rate of return would no doubt, have been lower.

Other tag returns in 1954 showed an eight per cent return by hunters. These returns came from the Evangeline Game Management Area, Catahoula Game Management Area and in Concordia Parish, where 350 squirrels were tagged and 29 returns were made.

TABLE III

RETURNS SHOWING THE TIME ELAPSED BETWEEN CAPTURE, RECOVERY AND THE DISTANCE TRAVELED

Locality Tagged	Tag No.	Date Tagged	Date Killed	Time Elapsed	Distance Travelled
Evangeline Game Management Area	403	4/8/52	10/8/54	2 yrs. 6 mos.	Local
	477	4/30/53	10/7/54	1 yr. 6 mos.	Local
	941	9/22/54	10/4/54	12 days	Local
	681	10/6/53	10/3/54	1 yr. 1 mo. 4 days	Local
	467	4/9/53	10/3/54	1 yr. 6 mos. 24 days	Local
	492	8/26/53	10/3/54	1 yr. 1 mo. 8 days	Local
	939	9/15/54	10/3/54	18 days	Local
	476	4/17/53	10/2/54	1 yr. 5 mos. 15 days	Local
	450	12/9/52	10/2/54	1 yr. 9 mos. 24 days	Local
	438	1/9/52	10/2/54	2 yrs. 8 mos. 22 days	Local
	694	2/9/53	10/2/54	1 yr. 1 mo. 22 days	Local
	464	4/1/53	10/2/54	1 yr. 6 mos.	Local
	683	(Last of 1953)	10/1/54	(About 1 yr.)	Local
	478	4/30/53	10/1/54	1 yr. 5 mos. 1 day	Local
	435	1/6/52	10/1/54	2 yrs. 8 mos. 26 days	Local
	459	3/13/53	10/1/54	1 yr. 6 mos. 19 days	Local
	462	3/18/53	10/1/54	1 yr. 6 mos. 14 days	Local
	928	5/17/54	10/1/54	4 mos. 15 days	Local
	693	(Feb., 1954)	10/1/54	(About 8 mos.).	Local
	497	9/10/53	10/1/54	1 yr. 21 days	Local
	920	(April, 1954)	10/7/54	(About 6 mos.)	Local
	927	5/14/54	10/2/54	4 mos. 19 days	Local
	696	5/7/54	10/9/54	5 mos. 2 days	Local
	486	(Oct., 1953)	10/23/53	(About 1 mo.)	7 to 8 miles from site
	449	12/5/52	10/24/54	10 mos. 20 days	2 miles from site
Catahoula Game Management Area	830	5/20/54	10/17/54	4 mos. 28 days	Local
Concordia Parish Game Management Area	1049	7/14/54	(Oct., 1954)	(Approx. 3 mos.)	Local
	1077	8/20/54	(Oct., 1954)	(Approx. 1 mo. 11 days).	Local
	1030	6/22/54	(Oct., 1954)	(Approx. 3½ mos.)	Local
Union Game Management Area	624	5/21/53	(Dec., 1953)	(Approx. 6 mos. 8 days).	Local
Sabine Game Management Area	183	2/21/52	(Nov., 1952)	(Approx. 9 mos.)	2 miles S. of site
West Bay Game Management Area	1758	6/5/54	(Oct., 1954)	3 mos. 26 days	9 miles S. of site
	1756	6/4/54	(Oct., 1954)	(Approx. 3 mos. 27 days).	9 miles S. of site
	28	3/17/54	(Oct., 1954)	(Approx. 6 mos. 15 days)	4 miles N. of site
	1424	7/2/54	(Oct., 1954)	(Approx. 3 mos.)	4 miles E. of site
	29	3/16/54	(Oct., 1954)	(Approx. 6 mos. 16 days)	2 miles N. of site
	1706	5/12/54	10/1/55	1 yr. 4 mos. 20 days	Local
	2103	10/5/54	10/1/55	11 mos. 27 days	Local
	2114	10/5/54	10/1/55	11 mos. 27 days	Local
	1775	6/10/54	10/1/55	1 yr. 3 mos. 21 days	Local
	1403	6/11/54	10/1/55	1 yr. 3 mos. 20 days	Local
	2024	3/9/55	10/1/55	6 mos. 23 days	Local
	2014	11/9/54	10/1/55	10 mos. 22 days	Local
	2177	10/21/54	10/1/55	11 mos. 11 days	Local
	1448	8/19/54	10/1/55	1 yr. 1 mo. 13 days	Local
	1716	5/11/54	10/2/55	1 yr. 4 mos. 22 days	Local
	41	3/24/54	10/2/55	1 yr. 6 mos. 9 days	Local
	38	3/18/54	10/2/55	1 yr. 6 mos. 15 days	Local
	37	3/25/54	10/2/55	1 yr. 6 mos. 8 days	Local
	1702	4/14/54	10/2/55	1 yr. 5 mos. 18 days	Local
	1770	6/7/54	10/2/55	1 yr. 3 mos. 25 days	Local
	1774	6/9/54	10/2/55	1 yr. 3 mos. 23 days	Local
	2112	10/5/54	10/2/55	11 mos. 28 days	Local
	2129	10/7/54	10/2/55	11 mos. 25 days	Local
	2109	10/5/54	10/2/55	11 mos. 28 days	Local
	1725	5/11/54	10/2/55	1 yr. 4 mos. 22 days	Local
	2128	10/6/54	10/3/55	1 yr.	Local
	2183	10/22/54	10/3/55	11 mos. 12 days	Local
	2144	10/8/54	10/3/55	11 mos. 26 days	Local
	2146	10/8/54	10/3/55	11 mos. 26 days	Local
	2126	10/8/54	10/3/55	11 mos. 26 days	Local
	2001	10/29/54	10/3/55	11 mos. 5 days	Local
	40	3/18/54	10/3/55	1 yr. 6 mos. 16 days	Local
	2159	10/15/54	10/4/55	11 mos. 20 days	Local
	32	3/16/54	10/4/55	1 yr. 6 mos. 19 days	Local
	1726	5/15/54	10/4/55	1 yr. 4 mos. 20 days	Local
	1717	4/14/54	10/4/55	1 yr. 5 mos. 20 days	Local
	1784	5/18/54	10/4/55	1 yr. 4 mos. 17 days	Local
	1759	6/5/54	10/4/55	1 yr. 3 mos. 29 days	Local

TABLE III (Continued)

RETURNS SHOWING THE TIME ELAPSED BETWEEN CAPTURE, RECOVERY AND THE DISTANCE TRAVELED

Locality Tagged	Tag No.	Date Tagged	Date Killed	Time Elapsed	Distance Traveled
West Bay Game Management Area—Continued					
	2150	10/13/54	10/4/55	11 mos. 22 days	Local
	2153	10/15/54	10/4/55	11 mos. 20 days	Local
	2198	10/28/54	10/4/55	11 mos. 7 days	Local
	2175	10/19/54	10/5/55	11 mos. 17 days	Local
	2113	10/5/54	10/5/55	1 yr.	Local
	2158	10/15/54	10/5/55	11 mos. 21 days	Local
	2190	10/26/54	10/5/55	11 mos. 10 days	Local
	1771	6/8/54	10/5/55	1 yr. 3 mos. 27 days	Local
	1429	7/8/54	10/6/55	1 yr. 4 mos. 28 days	Local
	2115	10/5/54	10/6/55	1 yr. 1 day	Local
	45	3/17/54	10/6/55	1 yr. 6 mos. 20 days	Local
	1438	7/23/54	10/6/55	1 yr. 2 mos. 14 days	Local
	2105	10/5/54	10/6/55	1 yr. 1 day	Local
	2186	10/26/54	10/6/55	11 mos. 11 days	Local
	1748	5/15/54	10/7/55	1 yr. 4 mos. 23 days	Local
	2008	11/4/54	10/8/55	10 mos. 27 days	Local
	1413	6/30/54	10/8/55	1 yr. 3 mos. 8 days	Local
	2193	10/27/54	10/9/55	11 mos. 13 days	Local
	2011	11/9/54	10/9/55	11 mos.	Local
	1704	4/22/54	10/9/55	1 yr. 5 mos. 17 days	Local
	1450	8/20/54	10/15/55	1 yr. 1 mo. 26 days	Local
	1783	5/20/54	10/15/55	1 yr. 4 mos. 26 days	Local
	1409	6/26/54	10/9/55	1 yr. 3 mos. 13 days	Local
	34	3/18/54	10/9/55	1 yr. 5 mos. 22 days	Local
	2123	10/6/54	10/8/55	1 yr. 2 days	½ mile from site
	2110	10/5/54	10/9/55	1 yr. 2 days	½ mile from site
	2120	10/6/54	10/5/55	1 yr. 1 day	2½ miles from site
	1786	5/16/54	10/5/55	1 yr. 4 mos. 20 days	8 miles from site

TABLE IV

SQUIRREL TRAPPING AND RETURNS

1952-55

LOCALITY	No. Trapped and Tagged	No. Retraps	No. of Returns (Shot by Hunter)	Hunting Status	
				1954	1955
Evangeline Game Management Area	114	39	25	open	open
Concordia Parish	36	7	3	open	open
West Bay Game Management Area	342	276	66	closed	open
Catahoula Game Management Area	257	79	1	open	closed
Union Game Management Area	112	34	1	closed	open
Caldwell Game Management Area	35	2	0	closed	closed
Jackson-Bienville Game Management Area	81	4	0	closed	open
TOTALS	977	441	96		

TABLE V

AGE AND SEX RATIOS
AND
BREEDING CONDITION OF ADULT FEMALES

(Fox Squirrels — No. Examined 4029)

1954 Season

Month		Male	Female	Female Adult	Female Juvenile	Female Adults		Female Juveniles	
						Breeding	Non-Breeding	Spring Born	Late Summer, or Fall Born
October, 1954	Percent	52.6	47.4	70.7	29.3	29.7	70.3	Not Classified in 1954	
	No. Examined	2120	1909	1350	559	180 pregnant 221 suckling	949	Not Classified in 1954	
(Gray Squirrels—No. Examined 5058)									
October, 1954	Percent	53.3	46.7	60.6	39.4	27.5	72.5	Not Classified in 1954	
	No. Examined	2698	2360	1432	928	63 pregnant 333 suckling	1036	Not Classified in 1954	
TOTALS FOX AND GRAY	Percent	53.0	47.0	65.1	34.9	28.6	71.4	Not Classified in 1954	
	No. Examined	4818	4269	2782	1487	243 pregnant 554 suckling	1985	Not Classified in 1954	

TABLE VI

AGE AND SEX RATIOS
AND
BREEDING CONDITION OF ADULT FEMALES

(Fox Squirrels — No. Examined 2552)

1955 Season

Month		Male	Female	Female Adult	Female Juvenile	Female Adults		Female Juveniles	
						Breeding	Non-Breeding	Spring Born	Late Summer, or Fall Born
October, 1955	Percent	50.1	49.9	43.4	56.6	21.1	78.9	83.5	16.5
	No. Examined	1279	1273	552	721	17 pregnant 99 suckling	436	602	119
(Gray Squirrels—No. Examined 686)									
October, 1955	Percent	41.0	59.0	60.2	39.8	34.1	65.9	68.3	31.7
	No. Examined	281	405	244	161	13 pregnant 70 suckling	161	110	51
TOTALS FOX AND GRAY	Percent	48.2	51.8	47.4	52.6	25.0	75.0	80.7	19.3
	No. Examined	1560	1678	796	882	30 pregnant 169 suckling	597	712	170

Data gathered on age, sex ratios and breeding are presented in Tables V and VI. The figures here are computed from animals examined during the hunting season in October. The combined ratios of fox and gray squirrels for 1954 shows an excess of males of six per cent. The 1955 figures reveal a female excess of about three per cent. This is the first time that females exceeded males in these bag checks. It is also interesting to note, that the excess of females occurred in gray squirrels only.

Based on size alone, an effort was made during the 1955 season to separate the spring-born juveniles from the summer, or fall-born animals. It is easily seen that the spring-born animals far outnumber the summer, or fall-born animals. It is believed that during good mast years the percentage of summer, or fall-born animals would increase, as the mast persisting on the ground would surely render the animals in a better breeding condition.

Quail Study

Robert E. Murry, *Study Leader*

As was stated in the last Biennial Report, "The best possibility for quail development to aid public hunting seems to be in the cutover pinelands." This statement is as factual today as it was two years ago. Presently there are encouraging developments that indicate that some large landowners are willing to allot a small per cent of their forest lands to quail development for public hunting.

Cost Study Segment

The site of this research has been transferred from the Camp Polk Military Reservation to privately owned lands near Cravens in Vernon Parish. On these lands the growing of commercial timber is the primary land use and they are open to unrestricted public hunting.

The stated aim of this segment is to determine cost and result of quail management by the application of one of three management practices as they are applied to separate areas. These practices are: installation and maintenance of automatic quail feeders, disking and planting common lespedeza, and the use of prescribed burning.

No figures are yet available for an accurate cost and result comparison and the study is being continued.

Quail Food Plant Investigation

Twenty-one different plants were sown to a variety of site conditions and subjected to different kinds of animal use in order that their seed producing ability could be determined over a wide range of conditions.

While several of these foods were domesticated plants, weeds of agriculture showed the most promise. One, which is known under several names in various parts of the state, did well in the presence of a problem deer herd on the Red Dirt National Wildlife Management Preserve and equally well on International Paper Company lands in Vernon Parish where it was exposed to cattle, horses and goats. This plant, known as "chocolate weed" on parts of its range, is called "tea weed" and "the rouge" or "red tea" in rice growing areas of the state. Seed can be obtained cheaply by purchasing rice mill screenings which are often rich with the small dark seed of this plant. While it was browsed by deer and rabbits on the cattle free range and was used by some or all of the animals on the open range it still made a fair yield of seed. These seed are presently being used by quail, doves and other seed-eating birds. The real test of this, or any other quail food plant, will be the amount of quality food it will provide for the critical period of late winter and early spring as well as the degree of maintenance it will require.

Another plant which was seeded to firebreak type strips in the cut-over pinelands is goatweed. This plant is well known to most hunters and wildlife workers as a producer of high quality quail and dove food. Since goatweed is favored by both soil disturbance and overgrazing, it seems to be adaptable to establishment on non-agricultural sites of this type. It is believed that once established, both chocolate weed and goatweed can be maintained by simple annual or biennial disking.

Numerous annuals that are native to the pine type are under study. Several of these annuals are always highly ranked in quail food habit studies. Since they are known to volunteer after soil disturbance they are being watched in order that we can learn to make the time and type of soil disturbance work in favor of the more desirable plants.

Agricultural type crops under observation are as follows:

Upland rice, Mung beans, Egyptian wheat, Reseeding sorghum, Reseeding red ripper peas, Annual iron clay peas, Reseeding Tory peas, Benne (or Bene), Kobe lespedeza, Serecia lespedeza, German millet, common lespedeza, Japanese buckwheat, bicolor lespedeza.

Several of these plants give favorable results when protected from cattle and deer. Reseeding sorghum escaped deer damage and Benne survived slight damage from both deer and cattle and made an abundance of seed. Of Benne, however, it is thought that the period of availabality is rather short and that the many seed are produced at a time when the food supply isn't a problem. Bicolor lespedeza was badly damaged by both cattle and deer while Kobe and common did moderately well with heavy cattle use and were untouched by deer.

A much larger selection of seed is available for the 1956 growing season and these will be planted under the same variety of conditions as those used in 1955. It is not expected that a "cure-all" plant will be found—rather it is hoped that close study of a large number of plants will provide the necessary know-how for intelligent quail development.

Statewide Segment

This deals with the collection of statewide information on the production and harvest of quail each year. Much of this information is solicited from hunters who are asked to contribute data on each hunt as well as to save the crop and one wing of each bird bagged. From the wings the ratio of young to old is computed and the hatching dates of birds less than 16 weeks of age determined. In general the larger per cent young in the population the more birds available for the hunter. Trends in quail populations can be determined for the purpose of future management.

In addition to the data collected from hunters, district personnel of the Fish and Game Division keep sight records of adults and young throughout the closed season. They also conduct two early morning whistle counts monthly in each district from April through August. The value of this information is chiefly in the nature of an index which serves to compare the production of one year to that of another.

The Red Dirt Hunt

From December 10 until noon Christmas Eve, 1955, the Red Dirt National Wildlife Management Preserve was open to quail hunting with no restrictions placed upon the number of hunters. An advance news release to press and radio had served to notify quail hunters throughout the state that the area was to be opened. Two permit stations were operated throughout the season to check the hunters into and out of the area. The 15-day season resulted in 127 permit holders bagging an even 400 quail from this 40,000 acre area that had been closed to all types of hunting for 18 years. This kill of one bird per 100 acres demonstrates again that protection alone is not the answer to our quail woes. Of course the protection afforded this area was not aimed at the bobwhite quail with its high breeding potential, but rather at establishing a harvestable surplus of deer on this and immediately adjacent deer ranges.

The small harvest of birds was no less remarkable than the young to adult ratio of 78:22. This simply means that of each one hundred quail taken 78 were birds of the 1955 breeding season. It also means that the average life expectancy of a bobwhite quail is considerably less than one year. The production rate of 7.6 young per adult female indicates very good nesting and rearing success for the previous breeding season. Considering all of the evidence present, it seems that natural mortality has been taking its annual toll without the aid of the shotgun. There is considerable evidence that each year this toll, with or without help from the hunter, is able to level the population back to that common denominator called "carrying capacity." Any quail management beyond the promulgation of harvest regulations that is not first aimed at increasing this carrying capacity seems likely to be doomed to failure.

Data on the Red Dirt hunt was collected by having permit station operators take a wing and the crop of each bird killed. More than one-half of the birds were weighed. The writer is indebted to Vince H. Reid of the U. S. Fish and Wildlife Service for aid in sorting the age classes and compiling the data.

Rabbit Investigation

Jack Sims, *Study Leader*

The Rabbit Research project was inaugurated in the Work Plan July 1, 1954. The primary objective of this study is to determine all factors possible about the life history of the rabbit and to determine the most practical means of managing rabbits in this state. The information obtained from the life history phase of the study will be helpful in setting bag limits and season dates. The information obtained from the management phase of the study will be helpful in establishing rabbits on ranges that are now barren or carry very low populations, although it should be pointed out that there are very few areas in the state which do not carry a nucleus rabbit population.

Three species of rabbits occur in Louisiana: (Sylvilagus floridanus), Cottontail rabbit; (Sylvilagus acquaticus), the swamp rabbit, and (Sylvilagus palustrius), the marsh rabbit. The cottontail has the largest range of the three species, being found in the cut over hill section as well as agricultural land throughout the state. The swamp rabbit inhabits large swamps and creek bottoms and is often found feeding on the edges of the bottom lands. The range of the marsh rabbit is restricted to the Gulf coast section along the numerous ridges and mounds. The cottontail may be found on the larger ridges of the marsh area where there is some agricultural activity.

During this study, very little time will be devoted to the management and life history of the marsh rabbit due to its limited range and limited area on which to do management work. It is believed that management practices can be developed to benefit both the cottontail and swamp rabbit, therefore this study will deal mainly with these two species.

To determine many factors of the life history of the rabbit, it was necessary to collect a large number of rabbits throughout the year. During the period of June 1954-May 1955, 280 rabbits were collected, of this number, 112 were cottons and 168 swamp rabbits. From examination of the rabbits collected, can be determined age and set ratio and average weights; from the adult females information on average litter size can be obtained. Each of these phases will be discussed individually and the findings presented in table form later in this report.

During the period covered by this report, 29 litters of embryos were examined, of this number, 17 were cottontails and 12 were swamp rabbits. In the cottontail, the litter size ranged from a minimum of three to a maximum of four for an average of 3.62. The litter size of the swamp rabbit ranged from a minimum of two to a maximum of three for an average of 2.75. It should be noted that the litters examined were unborn embryos, therefore the average live birth may vary slightly from these figures.

Seventy-five rabbits were collected and weighed during this period, 34 cottons and 41 swamp rabbits. Weights apparently vary according to the season and food availability. The average weight of 13 adult male cottontails was 1078 grams (2 lbs. 6½ oz.). The average weight of 21 adult female cottontails was 1184.12 grams (2 lbs. 10½ oz.). For the swamp rabbits, 19 adult males averaged 1921.33 grams (4 lbs. 5¾ oz.) and 22 adult females averaged 2078.66 grams (4 lbs. 10¼ oz.). In both the cottontail and swamp rabbits it will be noted that the average weight of adult females is greater than that of adult males.

Upon examination of 111 cottontail rabbits, it was found that 42.86 per cent were males and 57.14 per cent females. One hundred sixty-eight swamp rabbits examined showed 50.60 per cent were males and 49.40 per cent were females, indicating a sex ratio of about 50-50. This may vary due to the fact that during certain periods the female is not as active as the male. These percentage figures include both adult and juvenile rabbits.

In regard to the development and management phase of the study there has not been enough results compiled to give any definite recommendations. The period of greatest food scarcity for the rabbit is between December and March. It is believed that by planting certain winter crops, rabbit population can be maintained or increased on a given area. Tests are being conducted to determine which plants should be supplied for greatest results. The Commission now has an 880-acre research area under agreement with the Police Jury of Beauregard Parish on which all development work is being done.

In most instances escape and nesting cover are not limiting factors to the rabbit population in Louisiana.

Almost all rabbit ranges in this state now have adequate cover requirements. This is due largely to the growth of shrubs and annuals resulting from timber harvesting operations. However, the practice of clean farming and improved pastures has greatly decreased cover in agricultural sections. Clearing of wooded areas for pasture and cleaning out fence rows and turn-rows has in many instances reduced rabbit populations on farms. In many cases, these populations could be increased or restored to normal by planting supplementary cover. Improved pastures afford abundant food, but rabbits will not utilize this food unless escape cover is available. The planting of perennial shrubs would solve this problem in certain areas.

In closing, it would be fitting to give credit to the rabbit as a game species. According to a survey conducted in 1954 the rabbit ranked fourth in regard to the number of hunters; third according to the number of days hunted and fourth in the total number bagged.

It has also been noted that the sport of hunting rabbits with beagle hounds has greatly increased, several Beagle Clubs have been organized over the state. The increased popularity of rabbit hunting and the closing of large areas to the average hunter for other game species may bring the rabbit well up on the preferred game list in the near future.

TABLE I

RABBITS COLLECTED JUNE 1954 - MAY 1955

Species	Number Collected	Sex		Age	
		Male	Females	Young	Adult
Cottontail	112	48	64	33*	76*
Swamp Rabbit	168	85	83	39*	121

*The difference between these totals and total number collected was due to the fact that age of some rabbits was not determined.

TABLE II

AVERAGE NUMBER OF YOUNG PER LITTER

Species	Number Litters Examined	Average Number Per Litter
Cottontail	17	3.62
Swamp Rabbit	12	2.75

TABLE III

AVERAGE WEIGHTS OF ADULT RABBITS

Species	Males		Females	
	No. Weighed	Avg. Wt. in Grs.	No. Weighed	Avg. Wt. in Grs.
Cottontails	13	1078.00	21	1184.12
Swamp Rabbit	19	1921.33	22	2078.66

TABLE IV

SEX RATIO OF RABBITS

(Adults and Juveniles)

Species	Male	Per Cent	Females	Per Cent
Cottontail	48	42.86	64	57.14
Swamp Rabbit	85	50.60	83	49.40

Project 29-R-3, Work Plan VII

Acorn Mast Studies

Jack Collins, Study Leader

Oak mast has long been recognized as one of the more important wildlife foods. Rich in oil and starch, it is a source of food concentrates for wildlife. Mammals as large as deer and as small as mice vie for the acorn crop. Several species of birds notably turkey, quail and waterfowl, among the southern game birds relish oak mast.

Oaks are found in the four general tree regions of Louisiana. Whether they grow in the shortleaf oak, hickory, the longleaf pine, the bottomland hardwood, or the upland hardwood forest regions, the nut crop is used by wildlife.

Because of the importance of oak mast as a game food and the attention being given oaks in timber management on pine lands, the Pittman-Robertson Section, Louisiana Wild Life and Fisheries Commission, and the Branch of Research, U. S. Fish and Wildlife Service, began a cooperative study of oak mast yields in West central Louisiana on the Kisatchie National Forest. Initial studies began in 1950. The objectives of the investigations are: (1) to determine mast yields and any cyclic production characteristics that the oaks may have, and (2) to correlate mast production with three crown size, bole diameters, age, tree stand densities, and timber management practices. In 1954 the acorn mast production study was expanded to include a representative sample of the entire state.

The method of operation of the oak mast study was discussed in the preceding Biennial Report which contained information collected through 1952.

This report is comprised of data on oak mast obtained during the acorn fall periods of 1953 and 1954.

Of the three scrub oak species of trees under study; blackjack, post oak and bluejack or sandjack; blackjack proved to be the top acorn mast producer for 1953. Blackjack acorn mast production ranged from a minimum of zero to a maximum of 5,863.44 acorns per tree respectively. The total production for 16 blackjacks under study was 16,953.74 acorns and/or 56.45 pounds of mast.

Sandjack was the next highest acorn mast producer, with a minimum and maximum production of zero to 4,739.36 acorns per tree respectively. Sixteen sandjack oaks produced a total of 11,186.19 acorns and/or 23.32 pounds of acorn mast.

The total acorn production on six selected post oaks was 1,137.56. Production ranged from zero on one tree to a maximum of 557 acorns on the top producing tree. Compared with previous study years production was higher.

The per cent of sound acorns ran as follows: blackjack 91 per cent, sandjack 91 per cent and post oak 87 per cent.

Total production for scrub oaks in 1953 was by far the best over the three previous years study, with oak mast production in 1951 being the runner up. Consult Table I for the three year production figures on scrub oaks.

TABLE I

OAK MAST PRODUCTION ON 16 SANDJACK, 16 BLACKJACK AND 6 POST OAK TREES ON THE RED DIRT NATIONAL WILDLIFE REFUGE

Species	1950	1951	1952	1953
Sandjack	13,197*	12,848	9,629	11,186
Blackjack	2,312	8,902	3,893	16,954
Post Oak	749	4,344	330	1,138
Total	16,558	26,094	13,852	29,278

* Fourteen sandjacks under study in 1950.

On one plot on the Red Dirt Management Area, which is a scrub oak thicket composed of sandjack, blackjack and post oak, 20 traps were placed at random with no attempt being made to select individual trees for trapping. This plot is one acre in size, and the total production of acorns for the acre was 28,600 and/or 63.05 pounds.

Of the bottomland oaks under study, water oak proved to be the best mast producer. Throughout the entire study, water oak has consistently been the heaviest producer of acorns. Southern red oak was second in mast production followed by white oak and cow oak. Production on water oak ranged from a minimum of zero to a maximum of 34,918 acorns and/or 93.50 pounds of mast per tree. Sixteen water oaks under study gave a total production of 63,348 acorns and/or 155 pounds of mast.

Eight southern red oak trees produced a total of 21,544 acorns and/or 34.24 pounds of mast.

White oak and cow oak acorn production were as follows: 11 white oaks—12,619 acorns or 60.74 pounds and five cow oaks, 1,627 acorns or 19.50 pounds. See Table II for total acorn production throughout the entire study period.

TABLE II

OAK MAST PRODUCTION ON 16 WATER OAKS, 11 WHITE OAKS, 5 COW OAKS AND 8 SOUTHERN RED OAK TREES ON THE RED DIRT NATIONAL WILDLIFE REFUGE

Total Number Acorns by Years

Species	1950*	1951	1952	1953
Water Oak	3,365	26,276	51,027	63,248
Red Oak	7,198	2,834	4,909	21,544
White Oak	2,537	14,992	831	12,619
Cow Oak	..	1,395	239	1,627
Totals	13,100	45,497	57,006	99,038

* 1. Only 11 water oaks were under study in 1950.
2. Only 7 white oaks were under study in 1950.
3. No cow oaks were under study in 1950.

Per cent sound acorns in 1953 for these trees were as follows: water oak—82 per cent, red oak—84 per cent, white oak—98 per cent, and cow oak 90 per cent.

It appears that the peak of the acorn fall on scrub oak and bottomland oaks alike was between the third and fourth week of November in 1953.

Acorns on the study area were utilized heavily by deer and squirrels.

The acorn mast production study was expanded to include a representative sample of the entire state for the year 1954-55.

The following oak trees were under study during this period: willow oak, post oak, white oak, red oak, cow oak, overcup, water oak, blackjack, obtusa, sandjack, and nuttall oak.

Acorns were collected and tallied from all districts from September, 1954, through January, 1955.

TABLE III

TOP PRODUCER OF EACH SPECIES UNDER STUDY IN LOUISIANA IN 1954

Species	Total Production	Age	Dbh.	Crown Classification	Wt. of Acorns
Overcup	35,052	65 yrs.	17.7	Dominant	54.77 lbs.
Willow Oak	23,358	75 yrs.	32.2	Dominant	34.81 lbs.
Water Oak	21,958	53 yrs.	24.3	Dominant	24. lbs.
White Oak	19,312	27 yrs.	7.2	Dominant	122. gr.
Blackjack	13,572	33 yrs.	21.0	Dominant	214. gr.
Red Oak	5,966	34 yrs.	13.7	Dominant	80. gr.
Nuttall	2,908	180 yrs.	47.0	Intermediate	15. lbs.
Post Oak	2,860	.. yrs.	56.0	....	.. lbs.
Obtusa	1,688	74 yrs.	16.0	Dominant	1.86 lbs.
Sandjack	1,595	21 yrs.	9.2	Dominant	54. gr.

TABLE IV

TOTAL PRODUCTION BY SPECIES IN IN 1954 — STATEWIDE

Species	No. of trees in study	Total acorn Production
Overcup	36	147,593
Willow Oak	38	97,714
Water Oak	37	79,862
White Oak	30	45,375
Blackjack	17	27,014
Red Oak	26	32,191
Nuttall	18	17,629
Post Oak	25	18,024
Obtusa	9	3,764
Sandjack	31	5,541
Cow Oak	12	3,164
Total	279	478,871

As evidenced, by the above figures, overcup oak far outstripped the other oaks under study in acorn mast production for 1954-55.

By continuing this investigation for several more years, a thorough statewide picture of acorn mast production values will be obtained. This information can be used to advantage in timber and game management practices by both the forester and wildlife technician.

Timber Stand Improvement

Because of the increased emphasis being placed on release cutting of hardwoods in the pine forests, more commonly known as Timber Stand Improvement (T.S.I.), the Pittman-Robertson section, Louisiana Wild Life and Fisheries Commission, began a study on the Catahoula National Wild Life Management Reserve in 1954. This area is located in Grant and Winn Parishes.

Eight areas of 160 acres each were marked off and T.S.I. methods were applied, according to specifications listed below: (1) That method as prescribed by the U. S. Forest Service, (2) method usually used by the private landowner, (3) method recommended by wildlife technicians, and (4) two of the eight areas were left in the natural state for the purpose of comparisons.

Acorn mast, deer, and squirrel investigations will be made on the eight areas to determine effects on the game created by T.S.I. methods.

This study is in its infancy, and it is hoped that with detailed studies over a period of years, valuable information will be obtained which will help coordinate better wildlife and timber management practices in the pine lands of Louisiana.

Project FW 1-R

A Statistical Survey of Game and Fish Harvest and Management Data

Chas. R. Shaw, Project Leader

The purpose of this project, as indicated in the title, is to obtain statistically sound information from a mail questionnaire type of survey that covers the various types of hunting and fresh water sport fishing over the entire state. The information obtained includes daily and seasonal kill or catch of the different species of game birds, animals, and fresh water sport fish, as well as the amount of time and money expended on hunting and/or fishing activities. The information received is processed in such manner as to give breakdowns by parishes and/or districts. Therefore hunting or fishing pressure and success may be compared from parish to parish or district to district. As the survey continues of course comparisons will be made from year to year, thus disclosing any trends downward or upward in the different game species.

The first mail questionnaires were sent out in 1954 to a list selected by a modified random method from the hunting license receipt books. In the first mailing 14,929 questionnaires were sent out, of which 2,320 were returned as undeliverable due to various causes such as incomplete address, no forwarding address, or erroneous or false address. Those who presumably received the questionnaires but did not answer were sent a second or follow-up letter containing another questionnaire. A total of 3,453 answers were received. The information on these forms was transferred to punch cards in order to utilize Remington-Rand business machines for sorting and tabulating operations. In order to discover if there was a significant difference between the hunting efforts and/or success of those answering and those not answering, a random selection of five per cent of the nonrespondents were selected for follow-up interviews. This operation required a lot of time and travel over the entire state and it proved economically impractical to actually contact all of those selected, however some 255 interviews were conducted over the state and the results of these personal interviews were used to adjust or average out the figures obtained from the questionnaire returns when applying these figures to the total number of hunters in the state. This was only done for the six most important game species as the percentage of returns on the other species was too small to justify such calculations. The adjusted figures are shown below.

1953-54 Season	Percentage of Hunters	Average No. Days Hunted	Average Daily Kill	Season Kill
Squirrel	53.71%	7.36	2.09	15.35
Duck	31.11%	7.10	1.74	13.39
Rabbit	27.49%	10.52	1.49	15.66
Dove	15.79%	5.24	3.10	16.50
Quail	14.92%	6.21	2.53	15.75
Deer	19.93%	5.42	0.087	0.47

As the interview system had proved not economically feasable and could not be continued it was necessary to go back to the data as obtained directly from the questionnaires for comparison with the returns from the questionnaires of following years so a table of the figures as tabulated from the questionnaires without making any adjustments is given for the 1953-54 season. It can be seen that the daily and seasonal figures run noticeably higher in this table. However by using the same type of returns it was possible to make comparative bar graphs to illustrate the year to year changes that occur. The following table includes all ten of the game species listed on the game questionnaire.

1953-54 Season	Percentage of Hunters	Average No. Days Hunted	Average Daily Kill	Season Kill
Squirrels	59.37%	9.20	2.04	18.74
Rabbits	35.27%	9.49	1.44	13.70
Deer	19.78%	6.60	0.086	0.57
Quail	24.47%	7.38	2.47	18.27
Doves	25.57%	5.88	3.20	18.27
Ducks	43.84%	8.78	1.86	16.31
Geese	10.66%	6.69	0.77	5.15
Coots	7.09%	7.69	3.35	25.79
Snipe	4.08%	2.89	2.49	7.21
Woodcock	4.75%	3.40	1.49	5.07

There are several types of bias which tend to cause the returns from such questionnaire surveys to be on the high side. First is what is called "memory bias" in which the individual unconsciously tends to exaggerate his success by remembering the good days and forgetting some of the bad ones, and maybe slipping in a few for good measure, just in case he forgot some. Then, particularly in such species as deer and ducks we have the so-called "prestige bias" where the figures turned in are far above the actual kill because the individual fears that somehow he may "lose face" if he doesn't turn in an imposing list. However for use in establishing trends experience has shown that we can assume the percentage of error to remain about the same from year to year, so we can use graphs to show the percentage of variation from year to year. By using the 1953-54 figures as a base we can use the bar graph to show percentage variation in the various categories for the 1954-55 season. When similar surveys are carried on for several years it is possible to see whether the year to year differences are merely annual fluctuations or whether a definite downward or upward trend has been established for certain species and if so whether the trend is of such degree that it requires immediate remedial measures.

It was established that approximately 86 per cent of the licensed resident hunters were also fishermen, although it was not until the spring of 1955 that a regular questionnaire on fishing was sent out. The mailing list, selected by the modified random method, comprised 12,987 names or 7¼ per cent of the number of licenses sold in 1953. (The latest available receipts at the time the mailing list was made up.) Of this number 1,801 were returned undelivered for lack of sufficient address, etc., and 2,103 answers were received. A second mailing was made up and 733 more answers came in making a total of 2,836, a return of approximately 21 per cent.

Probably one of the most interesting portions of this survey is that dealing with the financial aspects of sport fishing, the results of which indicate that the average licensed fisherman in Louisiana has a considerable total investment in equipment pertaining to his sport.

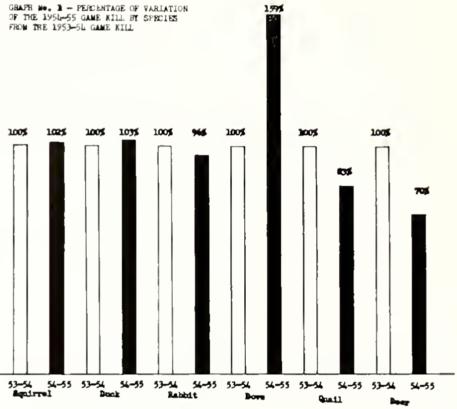
The average amount given as being spent for all types of equipment, including boats, motors, boat trailers, rods, baits, etc., was approximately $120 per licensed fisherman for the calendar year of 1954. The total investment averaged around $469, including all types of equipment. Each licensed resident fisherman in Louisiana spends approximately $257 per year on all expenditures in connection with his fishing activities, this includes all types of equipment, travel expenses, gasoline, oil, food, lodging, drinks and all expenses in any way connected with his pursuit of his sport of fishing. When these figures are multiplied by 187,832 (the number of licensed resident fishermen for 1954) we get the sum of $22,539,840.00 spent for equipment alone and $48,262,824.00 spent for equipment plus all other expenditures. Even allowing for the natural tendency of fishermen to exaggerate this would surely seem to indicate that sport fishing has a favorable position in the economy of the state. The financial figures for licensed resident hunters run somewhat below those given for fishermen. For hunting equipment of all types bought during 1954 the average was given as $87 per man. The total expenses averaged $115 per man for 1954 and the total value of all hunting equipment of all types in possession of the hunter was given as $358. This includes guns, dogs, hunting clothes, boats, motors, decoys, duck boats, boots, trailers and sometimes a hunting car or jeep. While this is a little lower than the figures previously given, the extension of these sums when multiplied by the 239,695 licensed resident hunters for the 1954-55 season makes a substantial amount. The total figures on all hunting equipment bought in 1954 runs to $20,863,465.00. When all expenses in connection with hunting activities are added it brings the sum up to $27,564,925.00. If we add both the amounts spent in connection with hunting and with fishing we have $65,827,749.00 being spent annually by the licensed resident sportsmen of Louisiana. Please note that this does NOT include the pole fishermen nor the out-of-state hunters and fishermen.

By comparing the following table of the results of the 1954-55 season with the previous table of the 1953-54 season slight changes will be noted in most species and a marked change in the status of the doves. This can be more easily seen on the accompanying bar graphs.

The following table gives the returns as obtained directly from the questionnaires.

1954-55 Season	Percentage of Hunters	Average No. Days Hunted	Average Daily Kill	Season Kill
Squirrel	50.88%	10.01	2.31	23.11
Rabbits	25.15%	10.75	1.77	19.05
Deer	17.36%	7.64	0.06	0.47
Quail	20.65%	7.77	2.38	18.50
Doves	31.55%	5.93	4.12	24.43
Ducks	37.64%	9.64	2.10	20.21
Geese	7.98%	7.42	0.93	6.93
Coots	5.89%	7.90	3.48	27.49
Wilson Snipe	4.49%	4.41	2.53	11.16
Woodcock	5.00%	1.77	3.24	5.74

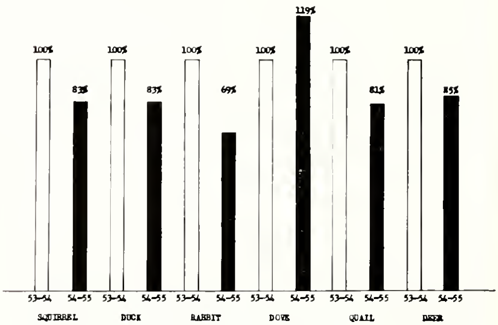
Graph No. 1, shows the percentage of variation of the 1954-55 game kill by species as compared with the 1953-54 game kill using the latter as the base. Graph No. 2, shows the percentage of variation of the number of hunters in 1954-55 as compared with the number of hunters in 1953-54. Graph No. 3, shows the percentage of variation in total days hunted by species, comparing the 1954-55 totals with the 1953-54 totals to show relative hunting pressure.



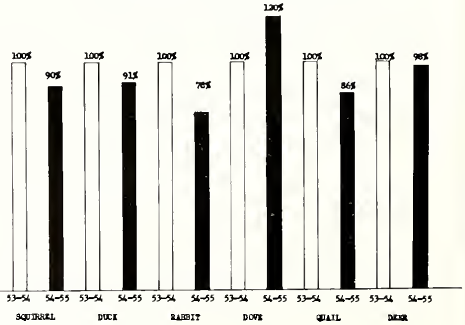
GRAPH No. 1 – PERCENTAGE OF VARIATION OF THE 1954-55 GAME KILL BY SPECIES FROM THE 1953-54 GAME KILL

LAFOURCHE GAME MANAGEMENT AREA

GRAPH NO. 2 - PERCENTAGE OF VARIATION OF THE NUMBER OF HUNTERS IN 1954-55 FROM THE NUMBER OF HUNTERS IN 1953-54



GRAPH NO. 3 - PERCENTAGE OF VARIATION OF TOTAL DAYS EACH SPECIES WAS HUNTED IN 1954-55 AS COMPARED WITH TOTAL DAYS HUNTED IN THE 1953-54 SEASON



Water Hyacinth Control Section's Program

By John G. Dutton, Supervisor

The regular session of the Legislature in 1954 appropriated $250,000 for hyacinth control work from the Conservation Fund. Of this sum, $50,000 was dedicated to be used in purchasing equipment and supplies and the remaining sum to be used at the rate of $100,000 each year of the biennium to cover operational costs of the program. Although this sum was not calculated to be sufficient to conduct an all-out statewide fight to control this plant, it was twice as much as we had for the preceding biennium. Surely it was sufficient to prove the efficiency of our operation and to show that the water hyacinth can be brought under control to such an extent that the hinderance it now exerts against progress in Louisiana's general economy can be reduced to a very insignificant amount.

The funds provided by the Legislature enabled us to procure modern and up-to-date equipment. Most important has been the type of equipment used in spraying the water hyacinths with 2,4-D to bring about their destruction. Early research on our part proved that high pressures of from three to four hundred pounds per square inch were excessive and of no value. In fact, these high pressures only served to produce a fog of the sprayed liquid which was blown by the wind or just floated in light air currents far from the intended mark. The chemical thus sprayed missed the water hyacinths and greatly increased the possibility of killing plants of value in the vicinity of the operation.

Therefore, these high-pressure pumps were supplanted by smaller ones that are much lighter and just as durable, and which produce pressures of not over 100 pounds per square inch. This lower pressure does not form a fog of the sprayed chemical. By using this type of pump, operated by a small air-cooled engine, the entire spraying unit was small enough for one man to handle instead of the former type, which weighed in excess of 500 pounds. This in turn permitted the use of smaller boats of aluminum and/or steel instead of the 1,750-pound steel barges that were formerly used.

We have adopted the 10 horsepower motor instead of the lower horsepower type for use where it is necessary to navigate in tightly matted water hyacinths. This type motor has proven itself to be much more efficient in navigating through these mats and affords more speed in going to and from the docking points and points of actual operation. This distance, in many instances, is from one to five miles.

It naturally follows that lighter and faster trucks can be used in transporting the spraying equipment overland from one body of water to another, thus cutting to a minimum that time which is not utilized in carrying out our main objective, viz., killing water hyacinths.

Because of the high cost pertinent to using outboard motors to propel our boats, or any other boat driven by an underwater propeller, we are now experimenting with the air-boat for use in transporting spraying equipment. One such boat has been procured, and, although this particular boat leaves much to be desired in some respects, it has proven conclusively that with the needed changes in its construction it will be far more effective and economical for use in many localities of our state where the waters have a heavy growth of underwater plant life. However, like the foot-soldier in our armed forces, we do not feel that the small craft, propelled by outboard motors, can be entirely supplanted by any other type of craft.

Another type of equipment which has proven of great value in our work is the 550-gallon capacity tank-truck which has been used in spraying water hyacinths in many miles of canals and borrow pits where the footing alongside them is substantial enough to support the truck. This unit is equipped with a spray-pump which produces 100 pounds pressure and throws the spray stream a distance of 150 feet without producing a fog. We intend replacing this unit with a tank-on-trailer unit which will be drawn by a light tractor. With wheels of larger diameter, equipped with large tires, this unit will enable us to travel over softer ground and thereby reach many places that are not accessible to our spray-gun when using the much heavier truck.

Our next step in improving our operation is to equip all of our floating units with a type of mixing valve that will automatically mix the 2,4-D with water as it is drawn from the stream and simultaneously spray the water hyacinths. Thus we will eliminate another great loss of time, amounting to about 20 minutes of every hour of the working day, which is now used in mixing the solution to be sprayed. This will also afford more room in the boats for the operators by eliminating the mixing tank and make a much lighter and more flexible type of unit.

The use of the marsh-buggy for traversing soft and marshy areas in which no type of floating equipment is able to navigate is also receiving our serious consideration for use in the future, when funds are available for their purchase.

With our thoughts ever on the possibility of performing a thorough job of hyacinth control, on a statewide basis, we cannot entirely eliminate the idea of using airborne equipment for spraying water hyacinths. However, because of the very high cost of using this method of spraying, as well as the strong possibility of losing control of the sprayed chemicals and killing valuable farm crops or other desirable plants, we are not greatly inclined toward bringing this method into use. Recommendations for its use by us will be made **only** where the job cannot be performed by other available means and where the possibility of killing farm crops or other desirable plant-life is absolutely nil.

Space does not permit the listing of each and every job of controlling water hyacinths we have accomplished in the last two years. However, we hope it will suffice to assert that many miles of canals, borrow pit and bayous, as well as many thousands of acres of our fine lakes have been kept free of this plant menace so that commercial fishing can again be carried on by those who follow this trade as a livelihood, and the sport fisherman can find a place to cast his plug. Aside from this, many millions of dollars and much time and effort have been saved for Louisiana's vast industrial and farming interests that depend on our waterways to a great degree for their successful and profitable existence.

Surely the results of our efforts during the past two years have shown conclusively that the water hyacinth can be brought under control to such an extent that the hindrance it now exerts against progress in Louisiana's general economy can be reduced to a very insignificant amount. Also that, in order to do a thorough statewide job of control, much larger sums of money must be appropriated for this purpose. We roughly estimate that, after the purchase of necessary equipment, the sum of $500,000 annually for a period of five years will be needed to accomplish a status of control after which smaller amounts will be needed yearly to maintain such a status. Surely such amounts are considered small in comparison to the many millions of dollars of loss and damage accredited to the water hyacinth annually in Louisiana alone.

Division of

Fur and Refuge

Ted O'Neil, Chief

The Fur and Refuge Division, responsible for the supervision, maintenance, and operation of 183,000 acres of marshland refuges and supervision, counseling and regulation of the fur industry, finds itself the recipient of both discouraging situations and yet challenging possibilities which were brought about by the combined and separate efforts of both man and nature.

Man, in recent years, with his efforts to inhabit and exploit Louisiana's four million acres of marshlands, has through neglect and uncoordinated programs and a lack of appreciation of a marshland's true potentialities allowed change and some loss of its former productivity.

Main and secondary arteries of cross country canals have been dug for all weather traffic from Mexico to the Great Lakes. Many others, not as extensive, serve various needs such as drainage of low lying uplands for new home sites, afford access to and safe harborage from the gulf's lucrative tidelands.

New highways, and their resultant canals now penerating deep into these marshlands have all contributed their effects of blocking freshwaters from the north, accelerating drainage in the marshes, affording extreme and rapid tidal fluctuations, and allowing salt waters to intrude into these areas.

Local citizens have been the unwitting culprits too with their numerous narrow ditches through the marshes, cutting corners on bayous and leading into tidal bayous affording transportation and ready access to fishing and shrimping waters. Nature, a willing partner, cooperated by sending a drought potent enough in itself to cause basic changes in these areas. The occasional rains that did fall, though ample enough, were only a comedy relief in this greater drama for they were usually accompanied by north winds that would immediately sweep this fresh reservoir into the small ditches which carried it over the marshes to pour over the banks of the leveeless canals that connected to the tidal bayous, which were waiting at low tide to receive these waters.

In a few hours rising tides would reverse this process allowing saltwater to intrude over these same areas. All interested parties could observe these occurrences and recognize that they would probably continue for sometime even with a return of normal rainfall.

The many landowners could hope that increased rains would alleviate conditions somewhat, but their individual areas small in size and varying in degrees of damage would not give sufficient reasons for attempting new ideas on management and any work done would necessarily be limited to conditions peculiar to that small area of marsh alone and not be broad enough to be applied universally, nor would these ideas even, if ever discovered be circulated and coordinated into one body of sound and proven marsh management practices because of lack of time and means and perhaps realization that this should be done.

Yet, as stated in the beginning, man and nature did leave a means and a way out that had to be noticed by someone and that means was through the discovery of oil on the state owned marshes and the way was for Fur and Refuge Division and the money derived from this oil fills the only remaining gap making the way possible now for the Fur and Refuge Division to accept this challenge of solving the problems for:

> The Fur and Refuge Division has the lands.
>
> These lands are in need of repair.
>
> The Division has experienced personnel, many native to these areas, to do the work.
>
> It now has the facilities and responsibility to record the research and results and to communicate them—both successful ones to be tried and unsuccessful to be avoided to all marshland owners.
>
> It now has the finances, which are derived from the lands themselves.
>
> It has stirred the interest of the nation's wildlife men, which should add advice and encouragement.
>
> It has the power and responsibility to accomplish this progress as a division of the Louisiana Wild Life and Fisheries Commission.
>
> And as a compelling force it has to live up to stipulations contained in the deeds to these refuges, which makes mandatory the use of these funds for research, improvements and maintenance or reversal of these lands to the former owners due to willful neglect, which makes this work mandatory.

For the past four years this division has been engaged in accomplishing these results by following a six-year program; avoiding for brevity's sake the more routine tasks of patrolling, maintenance and handling of the fur industry, the following pages give brief summaries of the more noteworthy projects begun within the last two years.

For an account of the preceding two years' work see the 1952-1953 Fifth Biennial Report and the December 1955 issue of the monthly "Louisiana Conservationist" magazine.

ROCKEFELLER REFUGE

Shutts Engineering Survey

The entire refuge boundary was surveyed by F. Shutts Sons, Civil Engineers who have had wide experience in all types of marsh survey work, especially the establishment of land lines. This survey included (1) reestablishment of all boundary lines and proper identification with permanent markers which will not deteriorate under marsh conditions and (2) the determination of "coast line retreat" by comparing the present position of the gulf coast with the position which had been established by previous surveys.

Geological Investigation

The geological investigation of Rockefeller Refuge was divided into two parts: (1) surface geology or marsh landforms and (2) subsurface geology which here includes stratigraphy, sedimentation, and the geologic history of the Refuge. A thorough knowledge of the geology was an essential prerequisite for the actual planning of the Rockefeller Refuge expansion program.

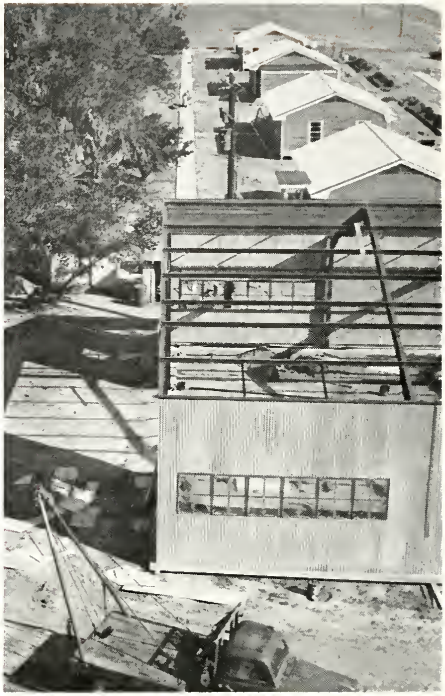
As it is the marsh landforms that control the marsh drainage and thus contribute to the eco-

Typical scene of blue geese feeding in marsh—on Marsh Island.

logic position of the marsh, it is essential that they be understood. Marsh landforms such as the present and former gulf shorelines, natural levees accompanying active and abandoned bayous and tidal channels, and the present and abandoned lake shorelines had to be mapped and described. Many of these features were related to the early development of the marsh and had been entirely or partially eroded away or had subsided and been covered by subsequent deposition. In the course of this phase of the study many miles of marsh were traversed and several hundred boreholes were drilled. In conjunction with the surface study, the vegetation of the Refuge was correlated with the geologic features.

The marsh drainage itself was studied from the standpoint of changes in the past and possible future changes. This was accomplished by sounding lakes and bayous and profiling the channels of tidal streams. In addition a study of the tidal variations within the Refuge was completed.

The subsurface phase of the study depended upon samples taken from deep boreholes. Boreholes were drilled to a maximum depth of 52 feet with cuttings taken from each foot penetrated. In this way the thickness and content of the marsh was established and the depth at which firm foundation material would be found was determined. The sediments were analyzed as to grain size and organic content. The environments of deposition for the various sediments were determined and the geological history of the Refuge worked out.



Rockefeller boat shed and houses.

The reports covering the geological investigation of Rockefeller Refuge and the geological investigation of Marsh Island and the Rockefeller Refuge levee study have been published as technical bulletins of the Louisiana Wild Life and Fisheries Commission.

24-inch 16,000 gallons per minute portable self-contained diesel engine pumping barge.

Inspecting a 'gator well (top)

A load of nutria and the trapper returns home; however, most of these big animals are skinned in the field.

Skinning muskrat and nutria and wringing them in old fashioned washing machine wringer.

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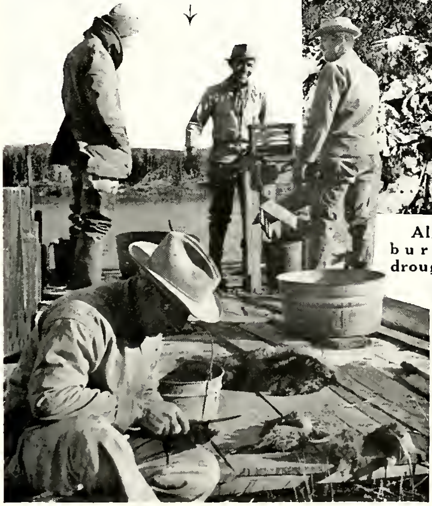
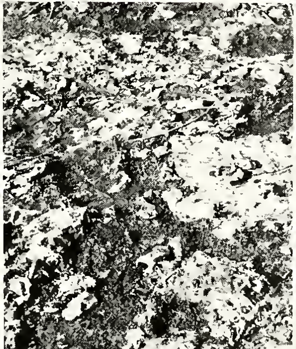
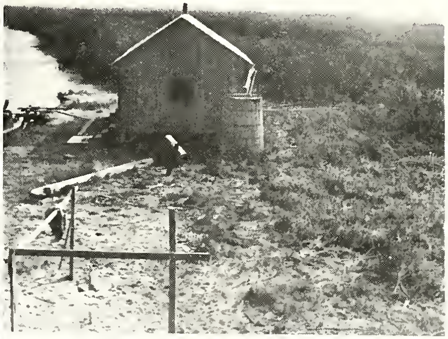




Algae on saltburn, due to drought.

Marsh Island supervisor and trapper.

Traveling over oyster reef during low tide enroute to pick up fur on the beach at Cheniere LaTroix, Marsh Island.



A lonely trapper's cabin in the Louisiana marsh.

Muskrat and nutria tracks.

Development of Refuge

An extensive development program was initiated on the basis of information derived from the geological survey such as the determination of natural drainage areas and the location of firm marsh soils which were a result of the original land depositional pattern. These land forms were often discontinuous and sunken below the present marsh surface. Before levees and dams could be built, it was imperative to know what soils were firm enough to support them.

Biological investigations had shown that the marshes of the Rockefeller Refuge had deteriorated to a condition where very few fur animals were produced and little use was made of the refuge by waterfowl. Saltwater intrusion, lack of maintenance and drouth had resulted in a complete change from a very productive marsh to one of practically no value, therefore control of water over the marsh was of primary importance. The following described impoundments, earthen dams and concrete water control structures were made to restore the marsh to its proper productiveness.

Impoundments

Effective management of impoundments requires a source of fresh as well as brackish water. A canal which extended from the western to the eastern boundary was dug along the north side of the refuge. Since this canal bisects the Superior Oil Company Canal which enters the refuge from Grand Lake, it provides a source of fresh water along the entire northern border of the refuge.

Biologist examines nutria burrow

Construction of impoundments on that part of the Refuge lying west of the Vermilion-Cameron Parish line has been completed with the exception of a few water control and diversion structures. Eight impoundments were constructed which contain the following acreages: 1,770, 480, 1,030, 5,680, 3,700, 1,000, 1,400 and 146 for a total of 15,206 acres. Two additional impound-

Airstrip and enlarged headquarters camp, State Wildlife.

ments comprising 2,400 and 840 acres and lying in Vermilion Parish are practically complete.

The construction of these reservoirs has necessitated the building of 93 miles of levees and the digging of 60 miles of canal.

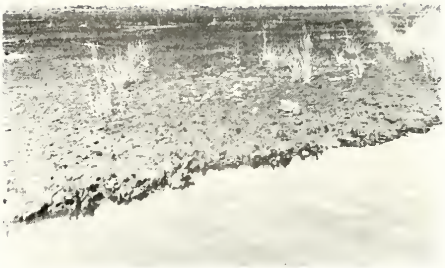
Salt Water Control Structures

Miller's Lake

A large area of marsh, about 5,000 acres, lying west and north of Miller's Lake was subjected to salt water intrusion with each high tide and then became completely dry during prolonged periods with normal tides. Conditions were such that the marsh was not used by fur animals or waterfowl. A short levee and earthen dam were placed above Miller's Lake. Approximately one and one-half to two feet of fresh to brackish water is now held over this area. The improved condition of this marsh has been followed by an increase in fur animals and waterfowl utilization. Thousands of ducks, coots and geese remained in this marsh during the winter of 1955-56.

Dorcelie Bayou - Old Humble Canal

About 1940 an oil company canal was dug near the gulf on the east side of Joseph Harbor. Abandonment of this canal permitted excessive drainage of several sections of marshland. Three fills were made at the mouth of the canal but each one washed out. A new canal which was dug above the old one, effectively blocked the old canal as well as Dorcelie Bayou. This resulted in the decided improvement of about 3,800 acres of worthless marsh.



Salt burn in area now in Impoundment No. 1, Rockefeller.

Deep Lake - Little Constance Bayou

An earthen fill was placed in Little Constance Bayou near the outlet of Deep Lake. This dike will prevent salt water invasion into Deep Lake and the surrounding marshland. This should improve Deep Lake which was once an excellent wintering area for diving ducks, especially canvasbacks. About 2,500 acres of marshland will be restored to its former productiveness.

Rollover Bayou

Six earthen dams were constructed in the tributaries leading into Rollover Bayou to protect about 6,000 acres from saltwater encroachment and at the same time hold a few inches of fresh water over the marsh. During aerial surveys several thousand ducks were observed feeding and

Dam to halt saltwater intrusion into marsh.

resting in ponds which retained a permanent water supply after this improvement.

A concrete control structure with four radial gates has been constructed on Rollover Bayou to control the freshwater and prevent saltwater intrusion.

Bertrand's Canal and Headquarters Canal

Two concrete water control structures with three radial type gates and two 36-inch syphons were constructed to carry the fresh water across the Headquarters Canal. The gates will separate the fresh water from the salt water and maintain suitable water elevation.

Humble Canal

Two 36″ wrought iron pipes have been placed across Humble Canal to carry the fresh water across Humble Canal.

Other Salt Water Barriers

It is anticipated that several other earthen dams and concrete control structures will be constructed across bayous draining directly into the gulf. By preventing salt water intrusion and by retaining fresh water over the marsh, several thousand acres of worthless marsh will be reclaimed for fur animals and waterfowl.

Auger used for subsurface sampling.

NEW HEADQUARTERS

Dirt Fill

A seven-acre dirt fill averaging approximately four feet in height was made near the northwest corner of the refuge along the Grand Chenier Road. This fill provides an excellent site for a centralized headquarters.

Housing For Personnel

The following housing facilities are nearing completion: one 3-bedroom house, one 2-bedroom house, one efficiency apartment containing four units, and one office-laboratory.

All houses have water, sewerage disposal and fire protection facilities.

Stand of giant foxtail, Rockefeller.

Boat House and Maintenance Shop

A large steel building 60′ x 208′ with 63 feet overhanging water was built for boat and equipment storage as well as a maintenance shop. The building has a 15 foot overhead clearance permitting the entrance of large equipment such as draglines.

Fire House

A fire house complete with pumping facilities was built to provide fire protection to all buildings and equipment at the new headquarters site.

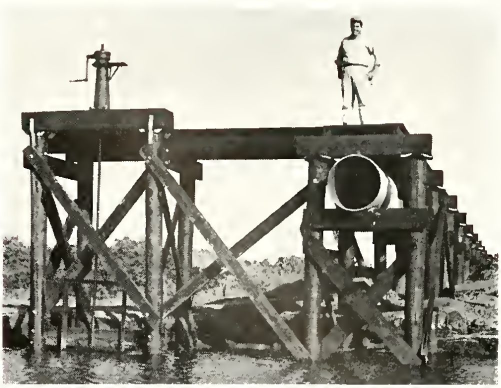
Water Well

A deep water well was drilled on the headquarters area and equipped with pumping facilities which will supply water to all buildings on the site.

Additional Water Wells

A six-inch well was drilled near the head of Bertrand's Canal to supply water to a nearby demonstration area. Failure of the water well at the East End Cottage necessitated the drilling of a new well.

Sinking cheniere on south shore of Grand Lake causes tree to die and topple over.



Outlet of pumping system on 150-acre experimental plot, Rockefeller.

Equipment

Several new pieces of equipment were purchased for refuge development and maintenance. The major additions were (1) A barge-pump capable of pumping 16,000 gallons of water per minute was purchased to add water to the impoundments during periods of insufficient rainfall, (2) a diesel driven pump was installed at one end of the demonstration area to remove water when present in excessive amounts, (3) four mud boats were acquired for maintenance and patrol work, (4) one shallowdraft speed boat for patrol work on the refuge and in outside waters, (5) one tractor and accessory equipment for improvement and maintenance of refuge, (6) one sprayer for pest plant control, (7) one $^{3}/_{4}$ ton and one pick up truck for refuge maintenance, (8) considerable scientific equipment for biological investigations.

Geologist checks tide gauge.

MARSH ISLAND

An extensive improvement program has been started on Marsh Island. This development includes the construction of a new headquarters camp, construction of a 7,000-acre impoundment and various earthen fills on small bayous. The impoundment was located by an intense geological investigation and the levees will be constructed on lines located during this investigation.

Geological Investigation

A geological study of Marsh Island was undertaken to locate an area suitable for a fresh-water impoundment and also to locate suitable water control structure sites whereby drainage and tidal action could be controlled and the marsh improved. As a result, the study was a complete investigation of the surface and near surface geology. Field work for this study consisted of, locating and describing marsh landforms, profiling streams and beaches, drilling boreholes and mapping the vegetation.

Prior to drawing conclusions as to what area would be suitable for a fresh-water impoundment, the marsh drainage patterns had to be established and explained. Thus the most logical area for an impoundment was delineated on the basis of the greatest possible benefit with the least amount of artificial improvements. In conjunction with the location of water control structure sites the drainage patterns determined what areas could be improved while the surface and near surface geology told if structures were feasible. Cross sections at possible bayou locations were necessary for these conclusions.

The final report of this study, in addition to the recommendations for an impoundment area and water control structure sites, described the stratigraphy and geologic history of Marsh Island.

New Headquarters Building and Fill

A new headquarters building has been constructed at Marsh Island to house the wardens and other employees while working on the refuge. This building has ample facilities to accommodate guests of the refuge.

The headquarters fill consists of approximately 2.5 acres of ground which will give plenty of space for landscaping and beautification of the lawn.

New Canal and Ditches

A new canal 3,000 feet long was extended on the south end of Bird Island Bayou to where the impoundment will be constructed.

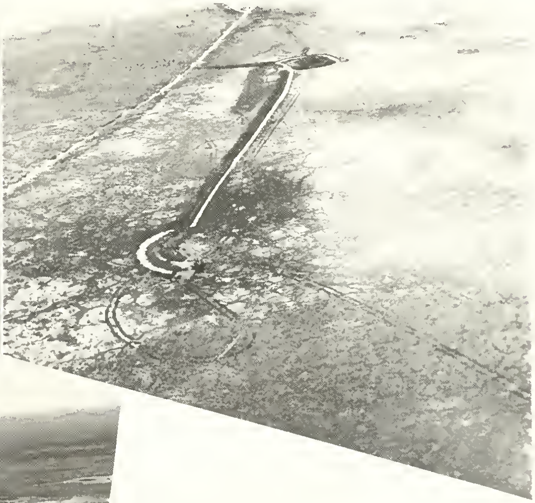
Ten miles of mud boat ditches were plowed on the island for patrol work and trapping.

Camp at Marsh Island.

Dam to prevent saltwater intrusion from old canals on Rockefeller Refuge.

Leeves repaired along the canals leading into Gulf east end headquarters on Rockefeller.

Nutria run through the marshes.



Islands constructed within impoundments for nesting and resting areas for wildlife.

One of 17 new water control lakes on Rockefeller. This one 4,000 acres.

Earthen Fills

Due to the intrusion of salt-water into some of the marsh on the refuge earthen dams were placed at the mouth of eight small bayous leading into the marsh. These dams will help hold fresh water on the marsh whereas in the past all rain was lost due to excessive drainage.

Impoundment

The contract has been awarded for the construction of a 7,000-acre impoundment to be located in the Chenier-LaCroix area. This area has not been a productive wildlife area in past years but should attract waterfowl in the future.

Boat Slip

A boat slip 20′ x 50′ x 6′ was constructed at Cypremort Point. This boat slip gives the employees a good place to work out of which is near the refuge.

Another boat slip was dug at the new headquarters site. A bulkhead was placed at the site to aid in loading and unloading heavy containers and equipment.

Equipment

Several new pieces of equipment were purchased for the refuge.

The following are the most important items purchased: (1) A 1½ yard dragline and barge was purchased for use on the refuge. Pile-driving leads were also purchased for the dragline. (2) A large twin-screw steel boat was purchased to be used for transporting equipment and fur. (3) 110-volt light plant was installed at the main headquarters for a power supply. (4) One Cypress Mudboat, 2 small workboats and 2 shallow-draft speedboats were purchased to be used in patrol work.

Dead garfish in canal.

Nutria run in marsh.

Marsh fire as seen from ground level.

STATE WILDLIFE

Several major improvements have been made at the State Wildlife Refuge. Improvements were made to the Headquarters Camp and the camp site as well as to the marsh itself.

The entire refuge boundary was posted at frequent intervals with enamel signs on creosote posts.

Since the headquarters camp site was subject to inundation at high tides, the site was raised about 18 inches with earth that was dredged from a new boat basin.

Bulkhead Surrounding Campsite

The old retaining bulkhead at the Headquarters Camp had rotted out permitting considerable erosion to the camp yard. This bulkhead was replaced by one constructed of overlapped 2″ x 10″ x 12′ creosoted boards which were placed inside piling to which had been attached 6″ x 6″ stringers. Since the piling was driven into the earth approximately 24 feet, the structure should withstand the most severe storms and will last for many years.

Construction of new bulkhead, State Wildlife.

Headquarters Camp

The Headquarters Camp was doubled in size by the addition of three large rooms. It is now possible to house and feed all employees working at the refuge.

A new work shop was erected at the camp site. The trappers camp was doubled in size and running water installed.

Boat Slip and Way

A large boat basin was dug in back of the camp headquarters.

Campsite and new bulkhead at State Wildlife.

Water Well

A new three inch water well was drilled at the camp site and a new pump and pump house built over the well. Since the drilling of this well, the camp is no longer dependent on a neighboring private camp for water.

Air Strip

An air strip approximately 100 x 1200 feet was made along the main canal leading to the camp. Part of the earth fill was obtained from the boat basin and the remainder from an adjacent canal.

S.L.I. Biological Laboratory

An old stranded beach site comprising about 30 acres and lying approximately one-fourth mile in front of the camp was leased to S.L.I. for use as site for a biological laboratory.

Marsh Improvements

Six earth fill dams were placed at strategic locations in the marsh to prevent violent water fluctuations in lakes and the surrounding marsh. Water in the lakes varied from very salty to fresh and from practically nothing in depth to several feet depending on the tide. Stabilization of the water level as well as the salinity will permit the growth of waterfowl food plants. The surrounding marshes have been improved for fur animal production.

A large island, 60 x 600 feet with an elevation four feet above water level, was built in Lake Fearman.

Fiddler crab concentration.

Nutria removal for weed control, Black Bayou, Vivian, La.

Fur Warehouse

Plans to renovate the fur house in Abbeville, Louisiana, will be out of the designing stage by April, 1956.

They include a large fur display and storage area, an office, bath and kitchenette for the watchman on the second floor. The ground level is to include offices for the engineers, biologists and geologists. An electric elevator will connect with an all weather loading dock for the safe handling of the furs.

Biological Investigations

Biological investigations of the Fur and Refuge Division have not only been conducted by division biologists but also by wildlife biologists in the Game Management Section of the Louisiana State University School of Forestry, biologists with the United States Fish and Wildlife Service, and parasitologists of Tulane University.

Nutria—Ecological Transects

A cooperative study is being carried on with the United States Fish and Wildlife Service in which data are being gathered on the following, (1) the effect of a high nutria population on marsh vegetation, (2) foods eaten by nutria, (3) recovery rate of different plants after being cut by nutria and (4) other miscellaneous information.

A series of transects have been staked out at the following locations: Marsh Island, Audubon Society, Belle Isle Ridge and Lacassine Refuge. A detailed check was made of the vegetation along each line. At periodic intervals these lines are rechecked and detailed notes made of nutria cutting and digging. By comparison with notes from earlier checks, it is possible to determine changes which have occurred at each transect. A preliminary report covering the first year's work is now on file in the Fur and Refuge Division office. This study will be continued for another year at which time a completion report will be written.

Exclosures

To supplement the above study four exclosures measuring 25 x 25 feet were built at the following locations: Marsh Island, State Wildlife Refuge, North Shore of Vermilion Bay and Rockefeller Refuge. These pens which were designed to keep animals out, are constructed of heavy chain-link type fence which extends from two feet below the surface to four feet above. In cattle grazing areas barbed wire was placed around the top. An additional barbed wire cattle exclosure which prevents cattle feeding on the plot yet permits fur animals to feed freely, was completed on Marsh Island. One exclosure was placed on a goose "eat-out." The vegetation within these exclosures is being compared with that on similar areas outside to determine what effect cattle, nutria and geese have on it.

Caged nutria placed near seismograph blast, Marsh Island.

Fish poisoning in ditches around impoundment.

Nutria Live Trapping and Tagging

Since little is known of the movement of nutria and trappers often report groups of animals moving across their land, a tagging program was initiated to check nutria movement. Approximately 350 nutria were live trapped and tagged at Rockefeller Refuge. Approximately 35 tags have been returned, two of which were recovered from animals that had moved more than 15 miles in six months. Since the trapping season is still in progress a final report cannot be given at this time. In addition to movement data, information was obtained on growth, age and size of animals at sexual maturity and number of young per litter.

Nutria and Seismograph Operations

Live nutria were confined in cages at distances varying from a few feet to a few rods from seismographic charges. The nutria were kept under observation for a period of three months following the explosions. No detrimental effects were discernible at the time of the detonations nor any time thereafter. One clapper rail which was subjected to the same experiment showed no signs of injury.

Line transects were established across marsh buggy tracks which were made during the seismographic explorations. Periodic checks are being made to determine the effect of the marsh buggy on different types of vegetation.

Nutria Parasites

This division initiated a study of the parasites of Louisiana mammals through a grant furnished John F. Schacher of the Department of Tropical Medicine and Public Health of the Tulane University School of Medicine.

That department saw fit to set up their studies under two main headings: (1) parasites of nutria and otter, (2) incidental findings in other native animals.

The reasons for a survey of nutria parasites were further clarified as follows: (a) to discover the endemic parasitic fauna, (b) to ascertain if this animal has acquired any parasites from native fauna since the time of its introduction into this country, (c) to determine the effect parasitic diseases may have on fur quality and (d) to determine if any diseases of the nutria are of a zoonotic nature, e.g., transmissible to man.

They considered the otter work important both for economic and strictly parasitological reasons.

We were informed that the final report of the study has been completed and will be in our hands before March 1956.

Nutria as Human Food

Experimenting cooking of nutria for human use was conducted by a home economist at Louisiana State University. Nutria was prepared by 35 different methods. Groups of people were invited to sample the various recipes. All of the samplers (74) with the exception of two were unanimous in their praise of nutria as human food. The manuscript for a bulletin containing the results of the cooking has been written and should be available for release by early summer.

Agricultural Damage

An extensive survey was made of nutria damage to agricultural crops. Greatest damage occurs in the rice growing section of the state. Since the nutria is a semi-aquatic animal, and rice is a semi-aquatic plant, it is only natural that nutria have moved into rice growing areas. Nutria cut and eat rice stems but seldom kill the plant unless it is cut below the surface of water. Most plants which are cut stool out and produce a head which matures after the uncut rice matures. Nutria also cut the small levees throughout rice fields in addition to burrowing in larger canal banks and about pumping stations. Slight damage was found in sugar cane, corn and sweet potato fields.

Garfish dies in the deep spot in small marsh pond during drought period.

Geese along highway in refuge area.

Nutria Distribution

In response to requests for nutria for stocking purposes, they have been distributed to individuals for release. Most requests have come from persons interested in weed control. Although it has been claimed that nutria will control weeds around lakes and ponds, biologists of the Fur and Refuge Division do not recommend them for this purpose.

Scirpus Olneyi—Three Square

Scirpus Olneyi is not only the major muskrat foods but also a staple food of geese and nutria. Little is known about the natural germination and establishment of stands from seed. Many tests of seed have shown the germination to be about 30 to 50 per cent in 40 days with most of the ingerminated seed remaining hard and firm and probably viable.

Seeds which were treated with caustic acids or scarified with sandpaper did not show as high a germination percentage as untreated seeds.

Several small seed beds were planted on Johnson Bayou, the north shore of Vermilion Bay, Audubon Refuge and Marsh Island. All seeding experiments were a failure. It could not be determined what happened to the seed. Further tests will be conducted under more carefully controlled conditions.

Marsh Deer Investigation

During the summer, fall and winter of 1954 there was a disastrous "die off" of deer in the marshes surrounding State Wildlife Refuge and on Marsh Island: Nine deer were autopsied by the L.S.U. Veterinary Science Department but no disease symptoms were found. Because of the pattern of death, the condition of the deer range and lack of disease symptoms, it is probable that the animals died of starvation. Lack of fresh water and the hoards of mosquitoes may have been contributory factors. It was not until a plentiful supply of succulent food appeared in the spring of 1955 that the surviving deer recovered. During the summer of 1955 rains were continuous and the deer range improved tremendously. Practically no poor animals have been reported since that time.

Alligators

A survey was made of regulations governing harvest of alligators and their management in the Southeast states as well as a survey of all available biological data for species. A statewide management program is being prepared for alligators based on the best information obtainable.

Nutria exclosure completed.

'Gator well, only water in marsh during drought period.

Ecology of Impoundments

Detailed studies are being conducted of the changes which result from the impoundments of a marsh area. Several permanent stations were located in Impoundment Number One on the Rockefeller Refuge at which regular checks are made of (1) salinity, (2) Ph. (3) Oxygen, (4) depth and (5) evaporation rate. Automatic recording gauges to determine water fluctuation have been placed at two stations. Line transects have been placed in different types of vegetation in order to measure increases or decreases of plant growth. Stakes were placed around the perimeter of some small stands of vegetation. Profiles are made of the levees at periodic intervals to determine levee shrinkage. Records are made of the number and species of waterfowl using the impoundment and general notes on other birds.

Grass Planting on Levees

Three experimental grass plantings were made on three levees at the Rockefeller Refuge in the winter of 1954-55. The species planted were Bermuda grass, dogtooth grass and saltmarsh grass. Bermuda grass was by far the most successful. By the fall of 1955 it had completely matted the ground and produced seed. Dogtooth grass was fairly successful but did form as dense a mat as Bermuda grass. Both saltmarsh grass

Plowing mudboat and pirogue trail.

and St. Augustine grass survived but covered only about half their respective areas in the fall of 1955.

Analysis of Marsh Vegetation

A chemical analysis was made of the more important wild life and grazing plants of the marsh. This analysis has revealed considerable seasonal variation in some species as well as a variation from one marsh to another. This study is being continued.

Marsh buggies used on refuge areas.

Dredging freshwater system on Rockefeller.

Water Fowl Food Plantings

During the summer of 1955 aerial seed plantings of millet and smartweed were made on levees and exposed moist sites of the Rockefeller Refuge. The millet was fairly successful and produced seed in the fall. The smartweed planting was a failure probably because of poor seed.

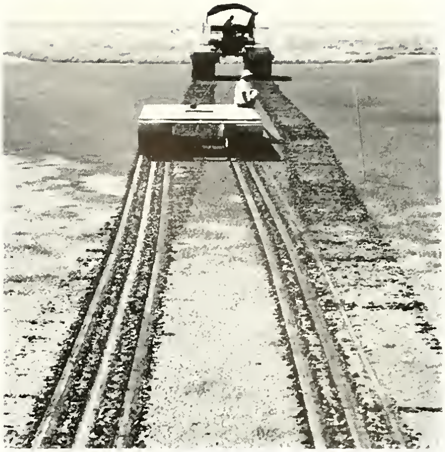
Banana water lily and wigeon grass were planted in Impoundment Number One. Considerable wigeon grass was present in the reservoir in the fall of 1955 but no banana water lily survived. Scirpus Olneyi plantings were made but nutria soon grubbed out all plants.

The Division is now sponsoring the preparation of a detailed report on the distribution and habits of the furred animals of the state. When published this report will complement the Commission's recently issued 556-paged, profusely illustrated work, *Louisiana Birds*, and will be written by the same author, Dr. George H. Lowery, Boyd Professor of Zoology and Director of the Louisiana State University Museum of Natural Science. There are few states with comprehensive books on both their birds life and their mammals. In recognition of the widespread public interest in all forms of animal life, as well as the need for much additional data on certain game and fur species in order to put into effect proper management practices, the Division of Fur and Refuges requested Professor Lowery to undertake the task of bringing together the available information on the mammals of the state in book form. To help make this work a definitive treatment of the subject, the Division engaged two graduate student biologists to work with Lowery in the summers of 1954 and 1955.

They traveled to various areas of the state to collect specimens and to map further the distribution of some of the smaller and lesser known mammals that inhabit Louisiana. Although the final report will give primary attention to fur bearers and game species, it will actually treat all mammals—bats, moles, shrews, armadillos, the numerous kinds of rats and mice, and even the aquatic species that live in our coastal waters. Each account will include the overall range of the species, the localities in the state where each form is known to occur, recognition marks, identification keys, and voluminous notes on life histories and habits. An artist has already completed 167 drawings of the cranial and other structural characters that are used in the species identification of the 59 species known from the state, and distributional maps have been prepared that consolidate data derived from the examination of well over 3,000 museum specimens.

Nutria Skinning Bulletin

We had the opportunity to cooperate with and advise the Louisiana State Department of Education on their recent publication entitled "How to Skin and Prepare Nutria Pelts."



Marsh buggy crossing dry lake bed in drought area.

Fur Movie

With the cooperation of John Blanchard, with the Education and Publicity Division, a 16-mm movie film has been made depicting the fur industry from the trapper to the finished product. Films are distributed through the Education and Publicity Division by their film loan library.

REVENUES RECEIVED FROM THE SALE OF FURS AND NUMBER OF ANIMALS TAKEN FROM THE STATE WILDLIFE REFUGE

SEASON	Muskrats	Mice	Mink	Raccoon	Otter	Nutria	Total Revenue	Dept's 35%	Trapper's 65%
1940-41	25,882	1,128	268	129	1	......	$ 34,176 73	$ 11,961.89	$ 22,214.84
1941-42	38,248	2,077	230	176	3	......	41,864.00	14,652 36	27,211.64
1942-43	44,874	1,770	219	172	3	......	62,250 19	21,787 62	40,462.57
1943-44	56,521	1,612	215	340	1	...	83,243 09	29,135 08	54,108.01
1944-45	47,370	1,800	120	212	3	4	57,844.74	20,245.71	37,599.03
1945-46	45,008	1,197	65	351	9	21	58,531.81	20,486 13	38,045 68
1946-47	23,725	1,236	54	135	6	47	21,443.27	7,505 14	13,938.13
1947-48	14,015	973	53	12	12	146	23,988.80	8,396 08	15,592.72
1948-49	4,276	272	36	66	11	251	6,254 76	2,189 15	4,065.61
1949-50	1,437	108	47		7	837	3,583.52	1,254.23	2,329.29
1950-51	4,058	281	59		13	2,244	17,602.80	6,160.97	11,441.83
1951-52	1,449	146	31	1	8	4,249	7,456.66	2,609 84	4,846.82
1952-53*			...			....			
1953-54	4,439	344	57		21	9,182	16,356.74	3,495 69	12,861.05
1954-55	2,979	76	80	31	17	11,407	22,313.55	7,654.00	4,659 55
TOTALS	314,281	13,020	1,534	1,625	115	28,388	$456,910.66	$157,533.89	$299,376.77

*No Trapping.

REVENUES RECEIVED FROM THE SALE OF FURS AND NUMBER OF ANIMALS TAKEN FROM THE MARSH ISLAND GAME REFUGE

SEASON	Muskrats	Mice	Mink	Raccoon	Otter	Nutria	Total Revenue	Dept's 35%	Trapper's 65%
1940-41	219,828	8,222	1,329	1,827	15	...	$ 275,593.25	$ 96,457.90	$ 179,135.35
1941-42	282,257	15,845	905	1,172	10		315,382.73	110,384.25	204,998.48
1942-43	173,166	12,180	589	811	8		237,796.12	83,228.63	154,567.49
1943-44	133,649	5,914	605	1,073	35		197,942.53	69,279.88	128,662.65
1944-45	110,967	4,953	536	1,100	14	8	137,944.19	48,280.52	89,663.67
1945-46	99,164	1,921	292	796	16	5	131,820.74	46,137.27	85,683.47
1946-47	145,356	4,084	475	995	22	11	130,325.84	45,614.06	84,711.78
1947-48	183,334	7,698	510	193	34	51	296,190.78	103,666.78	192,524.00
1948-49	138,030	12,640	297	254	26	71	165,606.12	57,962.14	107,643.98
1949-50	43,956	3,482	184	.....	32	484	39,105.23	13,686.84	25,418.39
1950-51	17,256	2,246	143	131	35	1,414	38,739.09	13,558.69	25,180.40
1951-52	3,802	634	170	113	28	4,154	12,454.97	4,359.24	8,095.73
1952-53	...	...	...		......	78	151.48	53.02	98.46
1953-54	2,016	225	120		28	10,042	20,159.13	5,518.67	14,640.46
1954-55	353	......	133	43	30	13,578	26,044.89	7,491.29	18,553.60
TOTALS	1,553,134	80,044	6,288	8,508	333	29,818	$2,025,257.09	$ 705,679.18	$1,319,577.91

REVENUES RECEIVED FROM THE SALE OF FURS AND NUMBER OF ANIMALS TAKEN FROM THE THE ROCKEFELLER REFUGE

SEASON	Muskrats	Mice	Mink	Raccoon	Otter	Nutria	Total Revenue	Dept's 35%	Trapper's 65%
1940-41	102		207	729	...	...	$ 1,747.11	$ 611.17	$ 1,135.94
1941-42	17,355	959	442	658	1	...	22,269.23	7,794.25	14,474.98
1942-43	38,786	3,211	966	919	4	.....	56,439.73	19,753.99	36,685.74
1943-44	63,844	2,884	696	1,266	8	.....	98,106.79	34,337.38	63,769.41
1944-45	35,330	2,110	375	1,280	4	2	45,570.05	15,949.58	29,620.47
1945-46	29,527	784	640	609	8	9	48,724.69	17,053.64	31,671.05
1946-47	30,499	1,255	870	1,098	7	25	29,580.69	10,353.23	19,227.46
1947-48	17,038	1,509	952	437	22	103	40,774.34	14,271.02	26,503.32
1948-49	5,130	405	500	451	15	80	9,581.88	3,353.67	6,228.21
1949-50	4,424	285	344	..	16	214	6,706.52	2,347.28	4,359.24
1950-51	7,090	952	588	..	15	548	21,623.83	7,568.34	14,055.49
1951-52	2,301	354	245	26	25	609	5,493.24	1,922.65	3,570.59
1952-53*	.	......	.....	...	......	....	....	....	....
1953-54	654	......	65	17	1	1,763	4,356.11	1,065.55	3,290.56
1954-55	66	...	184	97	10	5,704	13,793.89	4,730.22	9,063.67
TOTALS	252,146	14,708	7,074	7,587	136	9,057	$404,768.10	$141,111.97	$263,656.13

*No Trapping.

Profiling levee on Rockefeller Refuge.

Mudboat crossing dry lake bed in drought area.

ALLIGATOR TAKE IN LOUISIANA

Year	Less Than 5 Feet	Less Than 10 Feet	More Than 10 Feet	Total
1939-1940	9,123	4,028		13,151
1940-1941	1,549	1,379		2,928
1941-1942	4,881	3,854		8,735
1942-1943	2,013	1,135		3,148
1943-1944	6,943	3,930	16	10,889
1944-1945	5,373	3,259	12	8,644
1945-1946	17,136	5,476	62	22,674
1946-1947	26,165	7,181	63	33,409
1947-1948	22,378	10,542	59	32,979
1948-1949	24,807	10,931	35	35,773
1949-1950	22,959	6,917	36	29,912
1950-1951	27,696	8,108	92	35,896
1951-1952	21,797	6,535	79	28,411
1952-1953	14,606	6,094	86	20,786
1953-1954	11,440	4,470	15	15,925
1954-1955	7,548	3,558	38	11,144
	226,414	87,397	593	314,404

Construction of new bulkhead on State Wildlife.

Group of Blue Geese in the Museum at L. S. U.

Staking transect with bamboo poles, Rockefeller.

Eroded old bulkhead, State Wildlife.

Division of

Oysters and Water Bottoms

James N. McConnell, Chief

The Division of Oysters and Water Bottoms is proud of the fact that it is the oldest division of the Wild Life and Fisheries Commission, and marks the first organized effort in Louisiana to protect one of its greatest natural resources. The first attempt at oyster legislation is found in the Act of 1870, in the Revised Statutes. This Act was amended in 1871, again in 1886, next amended in 1892, then repealed and reenacted in the Acts of 1896.

In the year 1900, the General Assembly under a resolution appointed a joint committee from both the House and the Senate to study the needs of the oyster industry. Predicated upon the report of this committee, the Legislature, under the Acts of 1902, created the Oyster Commission of Louisiana.

In the year 1908, under Act 278, the Legislature created the Commission for the Protection of Birds, Game and Fish, which was amended and re-enacted by Act 265 of 1910. These two commissions were consolidated in the year 1912, under Act 127, under the name Conservation Commission of Louisiana. This Act was later amended by Act 66 of 1916, which was subsequently amended by Act 105 of 1918, which changed the name to Department of Conservation.

The amendment to the State Constitution creating three separate and independent State departments out of the former Department of Conservation was approved by the Legislature in 1944, and became Act No. 328. This amendment separated the Department of Wild Life and Fisheries from the old Department of Conservation.

Act No. 57 of the 1952 Regular Session contained a joint resolution proposing an amendment to the Constitution of Louisiana establishing the Louisiana Wild Life and Fisheries Commission under which we now function.

It seems apparent that before describing the functions of the Oyster Division that some information be given the layman as to just what is an oyster.

An oyster is composed of two very different parts: The soft body mass (which we eat and enjoy as food) and the shell which is outside that soft body and serves to protect it. The body is vital, energetic and carries on those activities which we describe as life; it takes in food, grows, breathes and provides for reproduction. The shell is non-living; it is essentially calcium carbonate which has been deposited by the mantle, the outermost layer of tissue of the body. The shell is in two halves or valves (one on either side) which are held together at one end by a tough, elastic hinge-ligament. This ligament acts as a string, tending to force the valves apart. The muscle of the body, however, is attached to both valves and by contracting tends to pull the valves together.

The oyster is found on either reef or mud bottom over which there is a mixture of fresh and saltwater. When the shell of the oyster is open, millions of tiny, hair-like structures on the gills beat back and forth, causing the pumping of water in one side and out the other. Dissolved or suspended in the water are oxygen, mineral salts, microscopic floating plants. The floating plants (diatoms), other microscopic floating organisms, and the mineral salts are taken in as the principal foods; the oxygen is necessary for respiration. When the oyster closes its shell, it places an efficient armor about its soft inner parts by which it becomes resistant to its natural enemies or to unfavorable changes in the water about it. Oysters live best in a mixture of fresh and salt water, ranging from 20 per cent to 75 per cent the salinity of pure ocean water. When the water becomes either too fresh or too salty, the oyster closes its shell until a more favorable salt concentration exists in the surrounding water.

Oysters in this state can be found breeding from April until October and in isolated cases even during the winter months. Breeding oysters are called "milky" because of the milky-looking fluid with which the gonads are filled. The milk of the female contains millions of minute eggs; that of the male, an incalculable number of extremely small spermatazoa. The milk is cast out into the water, where there is a chance intermingling of sperms and eggs. When sperm meets egg, fertilization of the egg occurs, of course, and the act of fertilization begins the cycle of oyster life.

The egg divides again and again, forming a ball of many tiny cells. In the course of a few hours small vibrating hairs, known as "cilia" appear on the developing young oyster. With these cilia it keeps itself suspended while moving about at the mercy of the water currents. Within three days, the embryo develops a pair of tiny shells, which grow larger and larger as the larval oyster grows. Soon the larva seeks a hard, clean surface on which to attach. If it cannot find that surface, it falls in the bottom mud and is smothered. If it can find a suitable surface for attachment, however, the larva cements itself to that surface, loses all organs of locomotion and remains stationary for the rest of its life. The young oyster grows rapidly, and in the course of a few months becomes a tiny male. For the next year's spawning season, it usually changes to female, and from then on its sex may or may not be stable. It may remain female for years, or it may change back and forth very frequently.

The chief function of the Division of Oysters and Water Bottoms is to insure the productivity of the oyster bottoms of the state. To accomplish this, several important policies are being followed:

(1) **Shell planting and associated measures for reef improvement**—Reef improvement is a continuous and necessary policy of the Division. For example, to insure that there be a sup-

Seed oysters being loaded on barges for experimental beds.

ply of oysters on reefs, this Division (as authorized by law) requires all factories, corporations, etc., to return to the waterbottoms of the state, 20 per cent of the shells removed by these concerns when taking oysters from the natural reefs of Louisiana. These shells are necessary as places for attachment for young oysters or spat.

(2) **Leasing of bedding grounds to private individuals and corporations for their use in oyster production** — These oyster bedding grounds are leased by this Division. Surveys and allocation, as well as policing, are also handled by this Division.

(3) **Collections of rentals, licenses, privilege tax and royalties**—Rents for oyster bedding grounds, tonnage and dredging licenses, privilege tax, resale, shipping and shop licenses, and sand, shell and gravel royalties are collected annually. The total of these collections for 1954 amounted to $299,601.67 and for 1955 amounted to $417,452.02.

(4) **Regulatory measures for protection of reefs and bottoms**—Regulations governing seismic operations were formulated in cooperation with the various oil companies for the proper protection of oysters, fish, game and fur-bearing animals. These regulations are rigidly enforced and agents are placed with geophysical crews operating in the State.

(5) **Supervision of oil production activities to prevent pollution in coastal areas**—Due to the heavy increase in oil production in the coastal waters of the State, it became necessary to set up a special Coastal Waste Control Section to inspect and supervise oil production activities to prevent oil waste from contaminating the coastal areas. A patrol boat constantly patrols these areas to enforce Stream Control Commission regulations. An airplane is used in coordination with the boat to patrol the coastal waters and locate oil well wastes.

(6) **Biological research for determination of facts which will guide the Division in its work**—Research is essential, particularly at the present time, for finding the facts necessary for combatting the decline in oyster production occurring in the State. The biological staff has been engaged in a program of scientific research designed to secure essential information concerning: (a) Improvements of oyster culture methods; (b) the effect on oysters of oil and sulphur field pollutants; (c) the indirect effect on oysters of seismograph operations; (d) the effect of competitors and predators; (e) the condition of the State Oyster Seed Grounds.

(7) **Regulations for severing sand, shells and gravel**—This Division regulates the taking of sand, shells and gravel from the water bottoms of the State. Leases and permits for these operations are issued and royalties collected.

(8) **Shell planting and rebedding oysters**—A special program of shell planting is being carried on by this Division under a special fund obtained from royalty collected on oyster shells and set aside for this purpose.

Watchmen are kept at camps built to protect the Seed Oyster Reservations at Bay Gardene, Sister Lake and Lake Felicity. These men issue permits to all fishermen obtaining seed oysters from these reservations and a record is kept of seed oysters so removed.

The Port of Entry at Grand Pass which was destroyed by the hurricane was rebuilt at Bayou Pierre a short distance east of its former location. An inspector remains at the Port of Entry at all times to check all out-of-state boats removing oysters and shrimp from Louisiana waters. A record is kept of the amount removed which must check with our agent at Biloxi, Mississippi, who collects all taxes assessed against Mississippi canning plants which obtain their oysters and shrimp from Louisiana waters.

The following is a list of equipment used in carrying on the normal activities of this Division:

Patrol boat "Capt. Sandras," a 56 foot Biloxi-type lugger, powered by a 165 hp. General Motors diesel motor, manned by a crew of three men, captain, engineer and cook. This boat is also equipped with radio so that when on patrol it is in constant touch with the main office, the patrol plane, the Oyster Seed Ground camp at Bay Gardene, and the Port of Entry at Grand Pass. This patrol boat is also used as a base from which all oyster bedding ground surveys are made.

A 16-foot speed hull, powered with a 25 hp. motor is a tender for the "Capt. Sandras" and is used to speedily transport the surveyor over the shallow coastal areas where most of the surveys are made.

Much of the patroling is done by plane, and a Republic Sea Bee is found to be the plane best suited for this type of work. We find this type of plane most useful and indeed essential to the varied activities of the Division of Oysters and Water Bottoms. The plane in all of its activities is in constant touch by radio with the main office, the "Capt. Sandras," and the other radio stations. Because of constant coverage of our coastal areas by both plane and boat, violations of oyster laws are held at a minimum.

Other Division equipment consists of small cabin speed boats kept at our camps at the Seed Oyster Reservations of Sister Lake, Lake Felicity, and Bay Gardene, and at the Port of Entry at Grand Pass.

In addition to this, one 35-foot twin screw Chris Craft cabin cruiser is kept at Bayou Caddy and is used as a liaison vessel for our Port of Entry at Bayou Pierre.

Another twin screw shallow draft Chris Craft is maintained at Bayou Caddy and is used for obtaining water samples from the natural reefs of the Louisiana marsh areas so that continuous salinity and temperature records are maintained. This boat is also used for the making of oyster bedding ground surveys in the shallow marsh areas.

Shell Planting

During May 1954, all oyster canners removing oysters out of the State of Louisiana returned 20 per cent of the shells taken as "cultch" for the furtherance of the natural reef production. This 20 per cent amounted to 36,205 barrels of shells which were planted without cost to the State of Louisiana. These shells were planted under the direct supervision of the Division of Oysters and Water Bottoms and were placed in Mississippi Sound off the northwest shore of Half Moon Island (Grand Island), and also along the north and west side of Grassy Island in Lake Borgne. A good set was obtained from the planting.

In May of 1955, 34,883 barrels of shells were returned and planted on a special plot staked off in Mississippi Sound between Nine Mile Bayou and Petis Pass; also on a much larger staked-off area in Bay Boudreaux surrounding Little Raccoon Island. Excellent results were obtained from both of these plantings.

Bayou LaMoque Fresh Water Diversion Project

Contract for the construction of the Bayou LaMoque Fresh Water Diversion Structure was let to the Morrison Engineering and Contracting Company for the total sum of $170,545.15 under Contract 4724 dated September 16, 1955, and a work order was issued by the Department of Public Works dated October 7, 1955. The contract allowed 180 working days for completion. The first work order has been received in the amount of $27,876.22 covering the period November 15, 1955 to December 15, 1955.

This project consists of four 10-foot by 10-foot concrete boxes with steel controlled flood gates. It is possible that we will be able to take advantage of any June rise which might occur in the Mississippi River during 1956. The completion of this project will be of great assistance to all of the natural reef oyster areas from Point Chicot on the north to Fort Bayou on the south in St. Bernard and Plaquemines Parishes.

REPORT OF COLLECTIONS (FISCAL YEAR)

	1953-54	1954-55
Bedding Ground Rentals	$ 38,870.00	$ 39,879.00
Privilege Tax	12,531.18	14,946.75
Tonnage Licenses	1,537.00	1,314.50
Dredging	9,050.00	7,550.00
Resale, Shop, etc.	1,060.00	1,025.00
Transfer Fees	26.00	14.00
Sand	1,459.47	1,862.06
Shells	234,742.22	349,319.94
Gravel	325.80	1,540.77
	$ 299,601.67	$ 417,452.02

Improper or careless placement of spoils have completely cut off a large section of this bay.

REPORT OF PRODUCTION (CALENDAR YEAR)

Total Barrels of Oysters Taken From Louisiana Waters

	1954	1955
Terrebonne	91,739.00	28,557.00
Lafourche	81,177.50	140,117.50
Plaquemines	318,676.50	219,823.50
Jefferson	83,644.50	70,597.50
St. Bernard	221,986.87	280,421.23
TOTAL BARRELS	797,224.37	739,516.73

Total Cubic Yards of Sand, Shells and Gravel Taken From Louisiana Waters

	1954	1955
Sand	97,017.51	121,108.39
Oyster Shells	866,160.44	910,805.54
Clam	1,615,952.83	1,964,050.29
Gravel	11,672.00	....

Bay Gardene Oyster Reservation

Bay Gardene was opened for dredging in October of 1954 and 9,742 barrels were removed from this bay.

During November 1955 Bay Gardene was again opened for dredging and 13,748 sacks of sack oysters were removed.

Sister Lake Seed Oyster Reservation

For the last two years Sister Lake has remained open for tonging purposes only but only a few oysters were removed by this method.

Sister Lake will again be opened for oyster dredging February 10, 1956. A complete record of all oysters removed from the lake will be kept and a biological survey will be made when the lake is again closed to dredging.

Large Scale Map

All oyster leases now being surveyed are being plotted on a large scale map of the well known "T sheet" scale of 1:20,000. As soon as the necessary funds can be obtained all of the current live oyster leases will be located on this map and special personnel has been employed to keep this map up to date in every respect.

In addition to the live oyster leases it is planned to also place on this map the location of all the natural oyster reefs in our coastal waters. When funds are obtained this project should be completed within 18 months from the time such funds are made available.

A second map should be made showing all oil fields, gas fields and sulphur deposits in the coastal areas, and should be of the same scale as the oyster lease map.

Seismographic Operations

New geophysical regulations have been promulgated for both inshore and offshore waters. These regulations are being strictly enforced, and assistance has been asked of all interested parties to contact the Division of Oysters and Water Bottoms as quickly as possible when violations are noted.

Certain of our heaviest producing oyster areas have been restricted for a period of 18 months from September 27, 1955, to the extent that all geophysical shotpoints must be at least 500 feet from oyster reefs or beds. (See map for locations.)

In these restricted areas a 30-day advance notice is required and operators are requested to cooperate with the biologists of the Division of Oysters and Water Bottoms and assist them in obtaining samples before, during and after shooting occurs so that additional information may be obtained on geophysical operations and their effect on oysters and oyster bedding grounds.

New additions to geophysical regulations will be adopted when such become necessary to protect any of our natural resources.

Changing Ecology

This Division is extremely cognizant of the danger to our oyster industry from the changing of the ecology of our coastal areas by the digging of pipe lines and canals.

This activity of the mineral interests causes changing and blocking of currents, silt deposits and in many instances bringing high salinity water into low salinity areas.

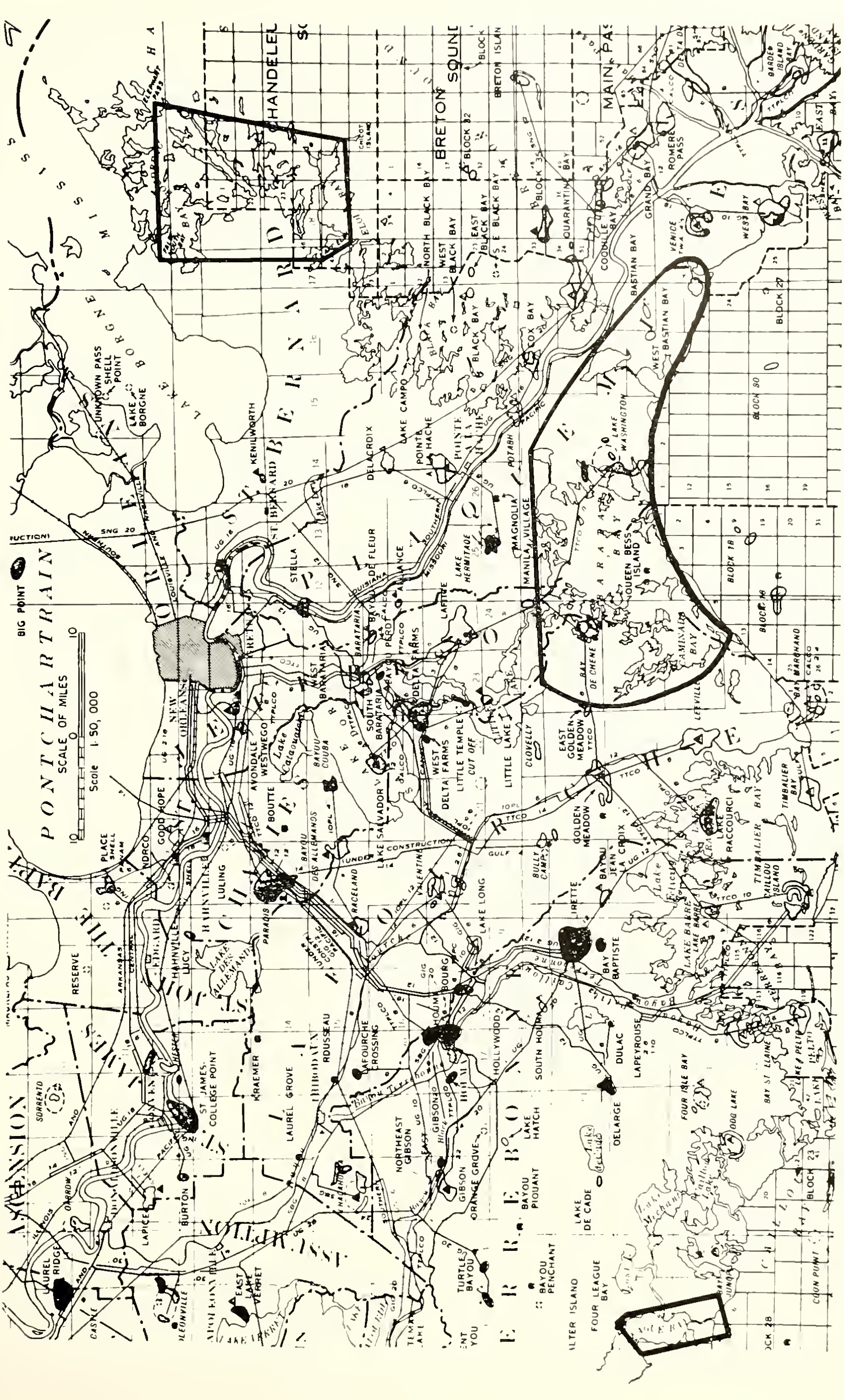
This Division presently is working with mineral production interests, together with U. S. Engineers in an attempt to eliminate as much damage as possible to our oyster interests from these causes.

Coastal Waste Control

The Wild Life and Fisheries Commission has been designated by the Stream Control Commission to be the enforcing agency for the Stream Control Commission and it has been the duty of the Division of Oysters and Water Bottoms to enforce the Commission's regulations in coastal waters.

Regular inspections are made of oil field installation and drilling operations by a patrol boat manned by a captain and a waste disposal inspector in the Southeast Louisiana coastal areas. Patrols are also made by plane.

Because of the tremendous increase in mineral development in our coastal waters it now seems essential that two new coastal waste con-

PONTCHARTRAIN
SCALE OF MILES
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0
10
BIG POINT
LAKE BORGNE
UNKNOWN PASS
SHELL POINT
KENILWORTH
ST BERNARD
CHANDELEUR
BRETON SOUND
BRETON ISLAND
MAIN PASS
NORTH BLACK BAY
WEST BLACK BAY
EAST BLACK BAY
BLACK BAY
QUARANTINE BAY
COQUILLE BAY
GRAND BAY
ROMERE PASS
BASTIAN BAY
WEST BASTIAN BAY
VENICE
WEST BAY
BLOCK 27
BLOCK 30
BLOCK 18
COX BAY
LAKE CAMPO
DELACROIX
POINTE A LA HACHE
LAKE WASHINGTON
MAGNOLIA
MANILA VILLAGE
BARATARIA BAY
QUEEN BESS ISLAND
CAMINADA BAY
BAY DE CHENE
STELLA
BAYOU DE FLEUR
ALLIANCE
LAFITTE
LAKE HERMITAGE
BARATARIA
WEST BARATARIA
SOUTH BARATARIA
DELTA FARMS
WEST DELTA FARMS
LITTLE TEMPLE
CUT OFF
LITTLE LAKE
CLOVELLY
EAST GOLDEN MEADOW
GOLDEN MEADOW
LA CROIX
BULLY CAMP
BAYOU JEAN LA CROIX
LAKE RACCOURCI
TIMBALIER BAY
CAILLOU ISLAND
LEEVILLE
NEW ORLEANS
AVONDALE
WESTWEGO
BOUTTE
BAYOU COUBA
LAKE SALVADOR
GOOD HOPE
LULING
HAHNVILLE
LUCY
RESERVE
LAKE DES ALLEMANDS
BAYOU DES ALLEMANDS
PARADIS
RACELAND
VALENTINE
LAKE LONG
LAKE BARRE
BAY BAPTISTE
BOURG
HOUMA
HOLLYWOOD
SOUTH HOUMA
DULAC
LAPEYROUSE
DELARGE
FOUR ISLE BAY
BAY ST ELAINE
DOG LAKE
LAFOURCHE CROSSING
THIBODAUX
ROUSSEAU
KRAEMER
LAUREL GROVE
ST JAMES
COLLEGE POINT
NORTHEAST GIBSON
GIBSON
ORANGE GROVE
BAYOU PIQUANT
LAKE HATCH
LAKE DE CADE
BURTON
LAPICE
DONALDSONVILLE
SORRENTO
LAUREL RIDGE
EAST LAKE VERRET
TURTLE BAYOU
BAYOU PENCHANT
FOUR LEAGUE BAY
BLOCK 23
COON POINT
LAKE MECHANT
ST. BERNARD
PLAQUEMINES
JEFFERSON
LAFOURCHE
TERREBONNE
ST. CHARLES
ST. JAMES
ASSUMPTION
ST. JOHN THE BAPTIST
UNDER CONSTRUCTION
GULF
SOUTHERN PACIFIC
LOUISIANA
MISSOURI PACIFIC
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trol boats and crews be assigned to our coastal areas to enforce the Stream Control Commission regulations. It is recommended that these boat crews be assigned as follows:

Boat No. 1. To patrol from Vermilion Bay to Bayou Lafourche.

Boat No. 2. From Bayou Lafourche to the mouth of the Mississippi River on the west side.

Boat No. 3. To patrol all areas in St. Bernard and Plaquemines Parishes each of the Mississippi.

More Office Space

It is of the utmost importance that additional office space be obtained as soon as possible. It is my sincere belief that at least three times the present space now in use is urgently needed.

Future Plans

No oyster producing area in the world has more complex biological problems facing it than does the oyster industry in Louisiana, due primarily to the tremendous mineral operations now continually expanding in our oyster producing areas.

These operations of necessity consist of geophysical operations, the laying of pipelines, and the dredging of canals in order to bring drilling rigs of approximately seven-foot draft to locations where normal water depths are approximately three feet. Add to this the continual pollution problems facing the oyster industry at all times in our coastal waters.

It is believed that a long range biological program properly planned by our chief oyster biologist is essential to the welfare of the oyster industry in Louisiana.

Additional shell planting is becoming more and more essential in Louisiana and a 50 per cent increase in shell planting is planned for this spring. The backbone of the oyster industry in Louisiana lies in that area of natural oyster reefs lying east of the Mississippi River in the Parishes of St. Bernard and Plaquemines. From this area approximately 80 per cent of all of our seed oysters are obtained and presently these reefs are in a most critical condition primarily due to lack of freshwater. Several years of low river stages in the Mississippi, in conjunction with low rainfall in this area for several years brought about this condition. This fact of necessity has increased salinities and allowed the conch to make tremendous inroads on these natural reefs. Add to this the large increase in mineral operations in this area, causing by canals and embankments the changing of natural currents and in so doing the silting of many natural reefs.

Our Commission has now gone on record endorsing the necessity of obtaining additional freshwater from the Mississippi in any way possible. This Division will use every effort to obtain help through other interested state agencies and our congressional representation, as well as the congressional representatives of our neighboring state of Mississippi. The Mississippi oyster industry which obtains approximately 75 per cent of their oyster and shrimp supply from Louisiana waters has assured the writer of the full support of their congressional delegation in obtaining additional river water to the marsh areas in Plaquemines and St. Bernard Parishes east of the Mississippi River.

It is planned to carry on continued careful supervision of geophysical operations together with continued supervision of oil field production to minimize pollution problems.

Added supervision of oil and gas pipeline construction is planned to prevent as much as possible any changing of the ecology of the coastal area by changing the natural waterways with short cuts by pipelines.

More attention is to be given to privilege tax collections on oysters so that Louisiana will obtain full credit for the production.

Salinity and temperature records will continue to be regularly collected and evaluated. Coastal waste and pollution controls will be continued and increased.

Seismographic supervision will also be increased and continued. Supervision of all offshore geophysical operations will be continued.

Obtain the use of all shell royalties for the Oyster Seed Ground Fund, and from this fund to expend annually at least $150,000 in the rebedding of oyster and clam shells as "cultch." These plantings should be made in carefully selected suitable areas where, after consultation with the major oil companies, it was determined there was the least likelihood of further mineral production.

After careful biological studies, to find ways and means to obtain additional river water for the oyster beds in Terrebonne, Lafourche, Jefferson and Plaquemines Parishes west of the Mississippi. It is of the utmost importance that some way be found to bring additional river water to the Louisiana Marsh areas in St. Bernard Parish from Point Chico to Mississippi Sound.

Comment on Owen Report

During June 1947 the Louisiana Department of Wild Life and Fisheries entered into a contract with a marine biologist, H. Malcolm Owen, Ph.D., to ascertain if possible the cause or causes of the unusual oyster mortalities occurring in Louisiana waters. From June 1947 through July 1950 concentrated and uninterrupted research was carried on. Sporadic research was continued from September 1950 to September 1954.

All of the above work was done under the sponsorship of the Division of Oysters and Water Bottoms.

During the early part of the year 1955 Dr. H. Malcolm Owen submitted to the Louisiana Wild Life and Fisheries Commission his completed report, enclosed in two volumes. One volume consisted of 387 typewritten pages. The second volume consisted entirely of photographs, charts, graphs, etc. It becomes necessary in any report from the Division of Oysters and Water Bottoms to the Louisiana Legislature, that the conclusions arrived at from this study by Dr. Owens be quoted directly from this report:

> **"D. Conclusions**
>
> From the facts which have been collected (1947-1950), organized and studied (1947-1954), the following basic conclusions are drawn:
>
> (1) Unusual mortalities of oysters occurred in Louisiana waters under the conditions of high temperature and high salinity of the water.
>
> (2) The primary cause of these mortalities is **Dermocystidium marinum,** a pathogenic fungus. Predators are secondary causes of decreased production.
>
> (3) The environmental conditions of the oyster-producing area have been changing for the worse.
>
> (4) The industrial effluents studied are detrimental to oysters in concentrations above 1.0%.
>
> (5) This concentration was not found in natural waters.
>
> (6) The lack of river water during periods of high temperature (seasonal salinity cycles) has reduced the steady production of oysters west of the Mississippi River.
>
> The above conclusions fulfill the stated objectives."

There is one item which stands out and must be taken into consideration in all further studies of oyster losses in high salinity areas of Louisiana waters—**DERMOCYSTIDIUM MARINUM,** a pathogenic fungus.

The writer will not attempt to discuss the Owen report, as it is a scientific report and the writer is not a scientist. However, as Chief of the Division of Oysters and Water Bottoms since November 1926, and having had continual contact in the field with oystermen and constant observation of oysters on the oyster reefs, I feel impelled to make the following statement:

When Dr. Owen first called my attention to this new fungus, **Dermocystidium marinum,** I could not believe this was anything new in the Louisiana oyster and felt that this fungus had been with us always. I had remembered personally collecting samples of oysters from the lower Barataria Bay areas for display purposes at the Department Museum and for display at various State Fairs about Louisiana. At my suggestion, Dr. Owen located these oysters. I now quote Dr. Owen:

> "The specimens were preserved in formalin of an unknown percentage. They were in 14 museum jars of obvious old age. The glass tops of some of the jars were sealed with paraffin. All of the jars were difficult to open; in the majority of cases it was necessary to break the glass tops. Some of the larger specimens were suspended by a thread which was attached to the abductor muscle and to the top of the museum jar. The specimens were in an excellent state of preservation."

Biologist measuring and examining oysters before planting.

TABLE 38

Showing the Results of the Examination of Oysters Collected circa 1930 as prepared from the Specimens Taken from Individual Museum Jars, for Infestation of DERMOCYSTIDIUM MARINUM.

Location, as Stated on Labels and Sample Number	No. of Oysters Examined	Age of Oysters as Reported on Label	No. of Un-infected Oysters	No. of Doubtful Oysters	No. of Infected Oysters			No. Infected	Percent Infected
					Lt.	Med.	Hvy.		
Bedding Ground, Barataria Bay	3	2 yrs.	1	0	2	0	0	2	66.6
Bayou Scofield	3	4 yrs.	1	0	2	0	0	2	66.6
Bayou Scofield	2	4 yrs.	2	9	0	0	0	0	0
Grand Bank, Barataria Bay	4	2 yrs.	1	1	2	0	0	2	50.0
Independence Island, Barataria Bay	5	17 mos.	4	1	0	0	0	0	0
Casbond Island, Barataria Bay	10	1 yr.	6	0	3	1	0	4	40.0
Casbond Island, Barataria Bay	3	4 yrs.	2	1	0	0	0	0	0
Bedding Ground, Barataria Bay	4	2½ yrs.	2	0	2	0	0	2	50.0
Independence Island, Barataria Bay	6	2 yrs.	3	2	1	0	0	1	16.6
Jefferson Parish, Barataria Bay	1	3 yrs.	1	0	0	0	0	0	0
Casbond Island, Barataria Bay	4	3½ yrs.	3	1	0	0	0	0	0
Barataria Bay*	1	......	1	0	0	0	0	0	0
Jefferson Parish, Barataria Bay	1	3 yrs.	1	0	0	0	0	0	0
Gashon Island, Barataria Bay†	8	15 mos.	6	2	0	0	0	..	..
TOTAL	55	...	34	8	12	1	0	13	..

*Meat—109mm.
†1 cyst with heavy Bucephalus.

TABLE 39

Compilation of Results of Examination of Oysters Collected circa 1930 from, I. Barataria Bay, and II. Bayou Scofield, and Total of Infestation by D. MARINUM.

	No. of Oysters Examined	Age of Oysters	Number Uninfected	Number Doubtful	Infected Oysters			Total No. Infected	Percent Infected (Doubtful Negative)	Percent Infected after Omitting Doubtfuls
					Lt.	Med.	Hvy.			
I.	36 14	0–2.4 2.5–5	21 10	6 2	8 2	1 0	0 0	9 2	25.0 14.4	30.0 16.6
Total	50	0–4 yrs.	31	8	10	1	0	11	22.0	26.2
II.	5	4 yrs.	3	0	2	0	0	2	40.0	....
Total	55	4 yrs.	34	8	12	1	0	13	23.6	27.6

Here is a case of a large bay being isolated by a spoil bank.

It should be noted that the above specimens were collected for show purposes and if the best oysters obtainable showed such a high percentage of infection, it would seem natural that if a poor grade of oyster had been obtained in this area in 1930 a much heavier infection would have been noted.

The writer was constantly in the lower Barataria Bay area during 1929 and 1930 and no undue oyster losses were noted.

For the above reasons the writer and many others cannot agree with Dr. Owens' conclusion No. 2. I quote:

> "The primary cause of these mortalities is Dermocystidium marinum, pathogenic fungus."

Biological Section – Oysters and Water Bottoms Division

Lyle S. St. Amant, *Chief Biologist*
E. J. Fairchild, *Assistant Chief Biologist*
A. V. Friedricks, *Biologist*
B. E. Strawbridge, *Biologist*

Introduction

The general excellence of Louisiana oyster production and quality of oysters in past years required little biological and technical attention. Because of this, basic biological studies of the oyster in Louisiana waters had been sporadic and uncorrelated over the years. Many gaps and unknowns were present in the general knowledge of oyster biology in the early 1940's when the great surge of oyster mortalities occurred. This resulted in near tragic consequences since the proper approach to determining the cause of mortalities generally necessitates the study and comparison of the unexpected abnormal condition with past normal conditions.

Because too little was known of the general biology and ecology of the oyster in Louisiana under normal conditions, the problem of determining the cause of oyster mortalities was very difficult to solve. Much work has been done on this problem since 1945, but results are still obscured because the normal picture of oyster production in past years is sketchy, and because the research programs to date were of necessity aimed at short term specific problems and could not integrate the overall picture.

This history of the lack of technical knowledge of oyster conditions points strongly to the need for a long range biological research program. Such a program should be aimed at studying all aspects of oyster biology and ecology and should be designed as a permanent and integral part of the oyster industry of the state. With the establishment of a long-range program results will not be spectacular, in most cases, but for the main part will be aimed at learning and gradually re-

Dr. Lyle S. St. Amant, chief biologist, Oysters and Water Bottoms Division, weighs an oyster in conducting research work on the year round condition of oysters.

habilitating the industry. It is impractical to expect an immediate cure-all program or a panacea for the ills of the industry. The only approach is to start a job now which should have been started 30 years ago and work toward putting the oyster industry on a stable foundation of technical knowledge within the next five to 10 or more years. Such a program will, of course, entail considerable initial cost since boats, specialized hydrographic and laboratory equipment, qualified personnel, and a marine laboratory must be obtained. After the program is initiated it may be expected to be maintained at an estimated cost of $150,000.00 per year.

Organization of Biological Section

Personnel: The present biological section of the Oyster Division was initiated February 1, 1955 when the writer was retained as chief biologist and head of the section. The first six months was principally utilized in securing qualified personnel and equipment. Because of the unavailability of trained marine biologists the chief biologist with one biologist aid and a boat captain did all of the work until July 1, 1955. Since that time A. V. Friedricks, Dr. E. J. Fairchild, Bruce Strawbridge and Hugh Champaigne, all trained biologists, have been added to the section. (Mr. Champaigne took a six-month military leave of absence effective January 1, 1956.) It is expected that one or two boat captains and biologist aids will be added to the list of personnel as soon as additional boats are available.

Equipment: Of vital importance to the biological program is adequate transportation. Since several days of each week is usually spent in the field it is necessary that the boats be of such size and design to afford living and work space for a field crew usually consisting of one or more biologists, biologist aid and a boat captain. In order to cope with the work load in a reasonable length of time it is necessary that a minimum of three such crews be active in the field at all times. With this in mind three boats have been ordered. Two thirty-footers and one of thirty-five feet. One thirty-foot cabin cruiser has been on hand and in use all year. Two small outboard hulls and motors are also in use.

Laboratory equipment was generally adequate and only a few items needed to be added. Field hydrographic and testing equipment, however, is grossly inadequate and is gradually being purchased.

Work organization: Past experience indicates that in order to accomplish orderly progress and results in a large biological research program that the various phases of the work be organized into specific projects and assigned to specific leaders. Such a plan is gradually being put into effect in the biological section. Each field crew will consist of a project leader, a biologist aid, boat captain, labor if necessary and a complete set of equipment including boat transportation so that interruption of work schedules will be avoided. Such a plan will eventually lead to full coverage of the oyster producing area on a district basis with full-time personnel assigned to work permanently in each district.

Outline of Present Research Program

Within the past 25 or 30 years two great changes have occurred in the oyster producing areas of Louisiana. These are, (1) the gradual increase of mean salinities in oyster areas which apparently is a result of the combined effects of flood control on the Mississippi River, subsidence

Andrew V. Friedricks, Jr., Oysters and Water Bottoms biologist, making water temperature and salinity measurements aboard the boat, "Shellfish," over Commission experimental oyster reefs.

of the coast line with gulf encroachment, and the effects of canaling, dredging and leveeing attendant to industrial expansion in the coastal area. (2) The direct effect of constantly increasing mineral exploration, with attendant seismic operations, pipelines, dredging, leveeing, pollution, and general disturbance of oyster producing areas. Coincidental with these ecological and physical changes of the oyster growing areas, oyster mortalities increased in summer months to the extent that the entire method of oyster culture had to be changed in order that the industry survive. While newer methods have managed to maintain the total volume of production—the general quality of oysters has declined, and the total value is less than before. Since the changes which have occurred in ecology are for the most part irreversible, a permanent biological program must be aimed toward developing methods to maintain and increase production and quality under present conditions and to attempt to prevent further unnecessary ecological changes in the area. Following is an outline of a program that should in a large part meet these needs but which should be kept flexible enough to meet new changes.

The program, in general, falls into five major phases. These are:

1. Basic ecological and hydrographic studies.
2. Securing flows of fresh river water to areas increasing in salinity.
3. Maintenance and development of our seed grounds which is the backbone of the Louisiana oyster industry.
4. Studies of methods aimed at improving the present system of handling and bedding oysters.
5. Studies of the effects of industrial advancement in coastal areas on the oyster industry.

The intended approach to each of these major problems may be outlined briefly as follows:

I. Studies of Basic Ecology and Hydrography

It is evident that all phases of oyster investigation must be correlated with the general ecological and hydrographic characteristics of the Louisiana coastal area. Although some excellent work has been done in the past along the Louisiana coast there still remain many gaps and a need for a comprehensive picture of the whole area. It is planned to gather as much information as possible toward this end and in particular to attempt to correlate this basic information with the following:

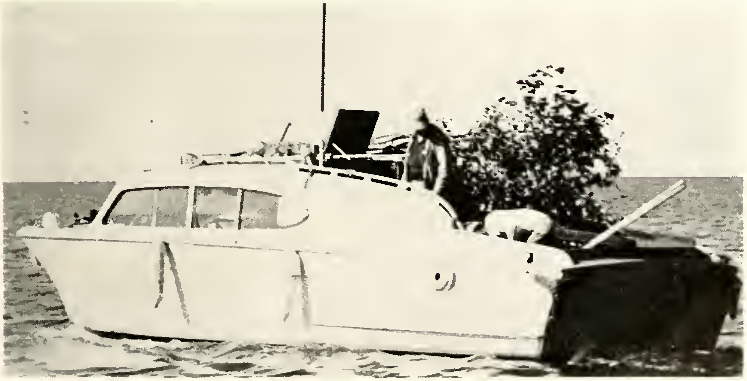
1. Oyster production in various areas.
2. Variations in oyster quality.
3. Oyster predation and diseases.
4. Incidence of mortality.
5. A need for fresh water.
6. Industrial activities; such as canaling and dredging.

II. Introduction of Freshwater into Oyster Growing Areas

Gulf encroachment, flood control along the lower Mississippi River, and industrial and navigational needs for canals have apparently resulted in an increase in the mean salinity over much of the Louisiana coast during the past 20 years.

Increased salinities have in turn resulted in changes detrimental to the oyster industry. These include:

1. Increased predation by drills on seed grounds, which is becoming a very serious problem, and increased predation on once drill free bedding areas.



Oysters and Water Bottoms Photo

Boat "Shellfish" and crew preparing to stake off experimental area.

A spoil such as this soon settles below the surface forming a navigational hazard as well as silting in oyster areas.

2. Increased mortality from the disease *D. marinum*.
3. Apparent reductions in spatfall in important seed areas.
4. A possible decrease in fertility, and minerals in certain areas of inshore waters as the fresh water supply is reduced.

The simplest answer to most of these problems is, of course, freshwater. Most oyster growers and biologists agree that additional fresh river water channeled to our oyster areas under controlled conditions would do much to alleviate the above problems, and certainly it should be possible from an engineering standpoint to carry out such a program. The principal phases of such a study would include these:

1. Locating sites to tap the fresh water reservoir.
2. Financing such projects.
3. Determining the volume of fresh water needed and the proper method of control.
4. Control of bacterial contamination.

III. Seed Ground Improvement

Louisiana's natural seed grounds lie for the most part east of the Mississippi River with a potential seed area developing around the mouth of the Atchafalaya River. In recent years seed production east of the river has been reduced apparently because of several factors:

1. First, increased salinities, as mentioned earlier, is causing—
    a. Less spatfall.
    b. Increased predation by drills.
    c. Possibly increased mortality.
2. Second, more extensive and intensive dredging of reefs is occurring each year. The reason for increased dredging seems to be:
    a. Changing methods of oyster culture since 1945 requires larger sized seed oysters, which means that more boat loads must be dredged and hauled in order to meet expected growth and production.
    b. Increased dredging of reefs for steam stock oysters.

Studies aimed at improving the seed ground area will probably include:

1. Location of new bottoms in less saline areas.
2. Studies of spatfall, growth, and quality of seed.
3. Investigations of more efficient means of bedding shells in order to increase production. These studies to include:
    a. Best density to plant shells.
    b. Selection of bottoms.
    c. Best size and type of shell to use.
4. Possible studies of the effects of dredging and culling for steam plant production or seed production.
5. Effects of adding fresh water to area.

IV. Studying Methods of Handling and Bedding

Since high mortality in recent years has resulted in a change in the time of bedding and the length of time alloted to growth on bedding grounds, studies of method of handling, planting, botton types selected, size and condition of seed oysters, growth and mortality could conceivably point to more efficient ways of handling and bedding oysters. Some of our work will be directed toward this end.

V. Studies of the Effect of Industrial Advancement in Coastal Areas on the Oyster Industry

With the advent of increased oil operations, sulfur discoveries, seismic operations, pipeline construction and the attendant dredging and canaling for navigational purposes, occurring coincidentally with increased oyster mortalities, contaminations, and silting—the conflict between the oyster industry and other industries mounts daily. Our office is bombarded with complaints of loss, damage and intrusion upon private leases by advancing industries.

Determining whether such damages are real requires an investigation of each complaint. This work alone requires practically the full time of one field crew and has absorbed most of the efforts of the program thus far.

Our plans for the future in this phase of our program falls into two categories:

1. We expect to continue to examine and analyze all complaints possible.
2. We plan to set up controlled studies when possible of those phases of industrial activities which give strong evidence of affecting oysters as determined by studies of the various complaints.

The exact direction of this work is not yet too clear but it seems at this time that some work is needed on:

1. The effects of silting from dredging operations proper and that which occurs in settling basins formed behind levees in under water spoil banks.
2. The effects of changing current directions and rates of flow by canaling in or near oyster beds.
3. The occurrence of oily taste in oysters with special reference to the use of oil emulsion and oil based muds in drilling operations.
4. The effects of seismic operations in certain types of oyster bedding areas.

Progress and Accomplishments During 1955

The progress and accomplishments reported herein cover only the period February 1, to December 31, 1955, since this is the only time that the writer has been involved in oyster investigations. Considering the fact that much of the time was of necessity used in securing personnel and equipment and in becoming generally acquainted with the various oyster problems, a considerable amount of progress and several important findings have been made. Following is a brief summary of progress discussed according to major categories.

I. Calcasieu Lake Investigations

A three month study of Calcasieu Lake was made during February, March and April. The principal aim of the investigation was to determine those factors causing and controlling levels of bacterial contamination of oysters in the south end of the lake. Cooperation was afforded the Wild Life and Fisheries Commission by the Louisiana Department of Health where all of the bacterial work was carried out.

Openings such as these in spoil banks are too small to be of any value in so far as preventing damaging ecological changes.

Since it was evident that bacterial pollution was coming from the Calcasieu River an experiment was set up which gathered data on daily salinities, water temperature, weather condition, river stages and other factors which might influence or indicate the amount of mixing of river water and gulf water occurring in the lake. Daily water samples were taken for bacterial analysis and bacterial counts on oyster samples were made three days each week. Twenty water sample stations were run daily and the oyster sampling stations were set up on the major reefs. A summary of the results obtained are as follows:

1. A direct correlation was found to occur between salinity of water and bacterial contamination. In cases where salinities were high as the result of an influx of uncontaminated sea water bacterial contamination was reduced and the reverse was true if great amounts of fresh water entered the lake from Calcasieu River.
2. In cases of normal river stage, South and Southeast winds and high tides produced high salinities and lowered contamination. North winds and low tides resulted in the opposite effect.
3. Higher than normal river stages caused by excessive rains affects the bacterial content of the lake adversely and in most cases overshadows the effects of wind and tides.
4. Throughout the 90 day investigation, there was only one period of 14 days in which bacterial contamination of water was below the accepted 70 m.p.n. During this period the bacterial count in oyster meat dropped markedly but in no case did it reach a m.p.n. of 70.
5. Evidence indicates that oysters would become non-polluted if periods of high salinities occurred for several weeks consecutively.
6. It seems probable from this preliminary work that if controls structures and levees were built which could prevent river water from entering the lake for a period of 60 days prior to the harvesting season, oysters would be marketable.
7. Any attempt to permanently bypass the river water around the lake would result in low oyster production, since most of the nutrients for the reefs would be cut off.
8. The cost of such construction when compared to the oyster production of the lake will in all probability prove to be excessive.
9. Probably the simplest and cheapest method to harvest and market the oyster production of Calcasieu Lake is to pasteurize and can the entire production of the lake at a single rigidly inspected cannery located at Cameron.

II. Oyster Seed Area Studies

Some work was initiated on oyster seed areas during 1955. This included shell plantings, spatfall studies, seed oyster production in the Bay Gardene Reservation, and a rather intensive study of the Sister Lake Reservation. Each of these will be discussed separately.

A. Results of Shell Plantings

In May 1955 some 35,000 barrels of shells returned from Mississippi canning plants were planted on the east side of the Mississippi River in the Louisiana marshes. Approximately 7,000 barrels were planted along the shore southwest of Petite Pass in the Mississippi Sound. The remaining 28,000 barrels were planted around Little Raccoon Island in Bay Boudreaux. Periodic examinations throughout the summer indicated

Biologist counting oysters in bushel units in order to measure total number planted.

an immediate and excellent catch. Spat counts indicated an average of five to seven per shell with excellent growth. By December of 1955 some of these spat were already being harvested by fishermen to bed on private reefs, although it was not expected that they would be utilized until the fall of 1956.

It is hoped that in 1956 a considerably greater amount of shells may be planted and that arrangements can be made to plant them in varying densities in order to determine the most practical system for planting shells.

B. Spatfall Studies

Complaints by oystermen, that a poor spatfall had occurred in the seed ground areas during 1955, instigated a preliminary study of the oyster spat catch in the seed areas east of the Mississippi River. This study involved selecting a transect of stations across the seed area from regions of low salinities to high salinities.

The general result of the investigation indicated that the spatfall average ranges from eight spat per shell to as low as 1.4 spat per shell as the examination progressed from the low saline areas to those of high salinity. The overall average indicated only a moderate catch but not to be considered alarmingly low.

Of considerable significance is the fact that general mean salinities are increasing in the seed areas which no doubt will continue to reduce the spatfall and allow the invasion of larger areas by the oyster drill (*Thais.*) The total result of such changes may greatly reduce seed oyster production in the future. Because of this it is imperative that new seed areas in less saline areas be developed by planting shell or discovered on existing shell reefs. Furthermore it is important that extensive studies be made in seed areas in 1956.

Biologist aide checking water salinity in process of taking hydrographic data.

C. The Bay Gardene Oyster Reservation

The Bay Gardene reservation is located east of the Mississippi River between Black Bay and American Bay. Its area is approximately 1,500 acres. During the year some studies were made in this area. Natural and planted reefs were examined and the area was mapped and all productive and potential reefs located by the engineering section. When the reservation was opened for a 30-day period during November and December complete data was kept on the production from various areas of the lake; the condition and size of oysters, and whether from natural or planted areas. These data have not yet been analyzed but will be presented in report form in the near future.

D. Sister Lake Oyster Reservation

Seed oyster production in Sister Lake (Caillou Lake) has been decreasing in recent years. Because of a need for information regarding this fact a more intensive study was made of the area in 1955. This report is based on data gathered on five separate examinations of Sister Lake throughout the summer and fall of 1955. For comparative purposes salinity records from 1951 to date are used. The principal aim of this preliminary study was an attempt to determine the following points.

1. The present location and extent of the productive oyster bottoms in the lake.
2. The condition, size, and density of oysters.
3. The extent of spatfall in 1955.
4. The distribution of oyster drills in the lake and factors controlling their distribution.
5. The extent of predation by drills.
6. The cause of present high salinities and determination of ways and means to alleviate high saline conditions if possible.

Location and Extent of Present Oyster Production

Sister Lake is a typical marsh lake located in the marshes of lower Terrebonne Parish. It is an irregular oval in outline approximately 5 miles long on its east-west axis and 2/5 to 3 miles wide on the north-south axis. Its approximate area is 7,000 to 8,000 acres. It lies in the drainage basin of Bayou de Large from which it receives most of its fresh water. It is also joined on the north by Grand Pass to Lake Mechant. The outlet from the lake to the Gulf is through Grand Bayou de Large at its west end and Bayou Grand Caillou on the east.

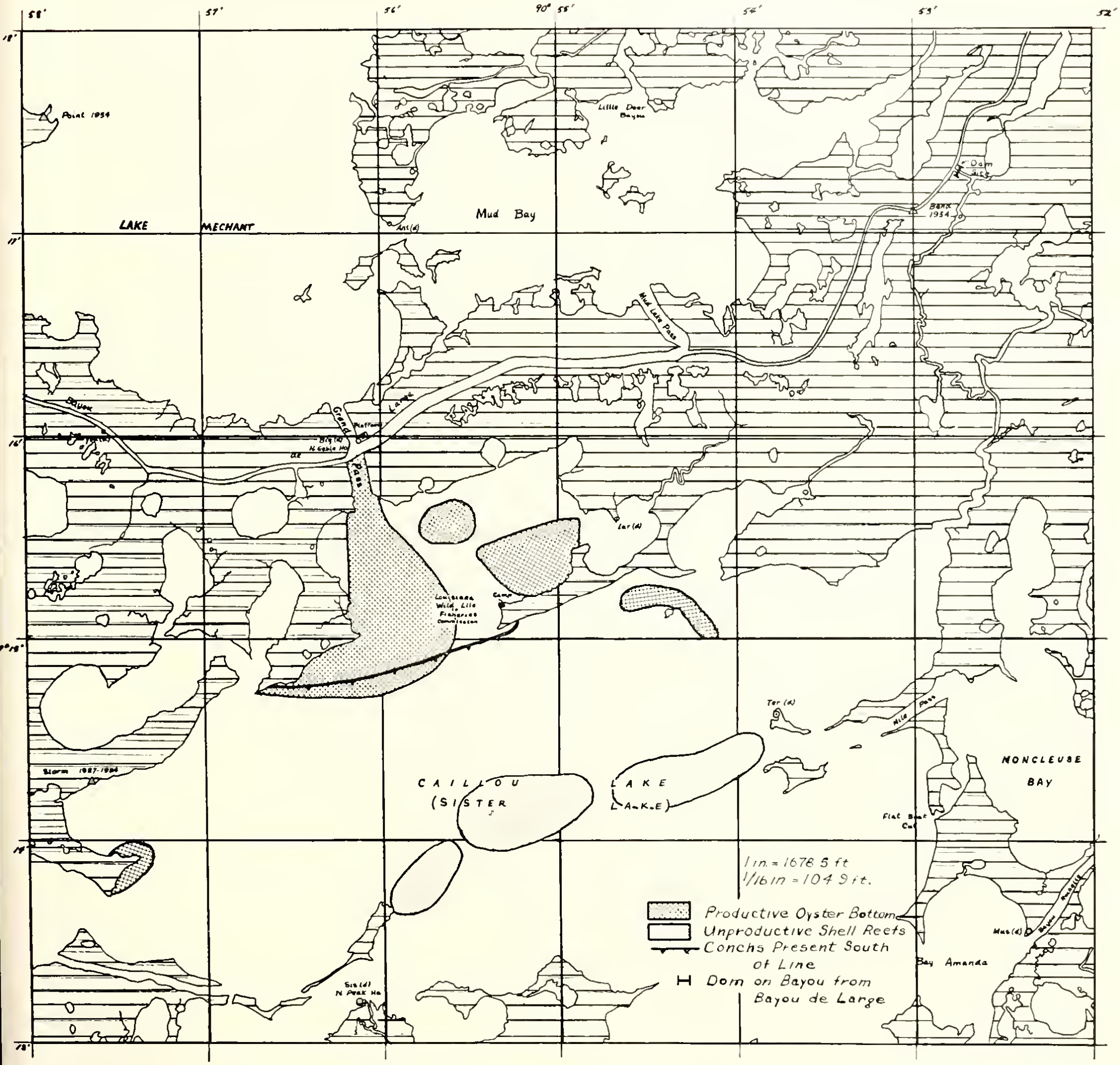
The water depth varies from one foot to six feet over most of the lake except in the main channel which runs from Grand Pass on the north side the lake across its western end to Grand Bayou de Large. The bottom is principally of mud except for areas of natural and planted reefs. (See map.) There is much evidence that Sister Lake was once an excellent oyster producing area. In recent years, however, the eastern and southern half of the lake has become less and less productive until at present there are few if any live oyster reefs to be found south of a line running from Walker's point on the western shore of the lake to the long point on which the Wild Life Commission Camp is located. In fact, practically all of the oyster production in the lake is confined to the small bay in the north end of the lake

Leland P. Hebert, mate on the boat, "Shellfish," works with biologists of the Oysters and Water Bottoms Division, recording measurements taken in oyster condition research.

An excellent growth (2.9 cm.) of oysters from recently established experimental reefs is being measured and recorded in research work conducted by biologists of the Oysters and Water Bottoms Division.

Earl J. Rhodes, captain of the "Shellfish," is shown tonging oysters from one of the experimental reefs which are being used for oyster research.

formed by these two points. (See map.) In this area it is estimated that between 600 and 650 acres of the lake bottom is producing oysters. Two small areas of productive bottom were found in the main body of the lake. One of these lies along the north shore of the main body of the lake about 1/2 mile east of the camp and the other around the point near Bay Voisin.



Condition, Size, and Density of Oysters in Sister Lake

Numerous oyster samples were dredged, examined, measured, and counted in order to get the clearest picture possible of oyster conditions in the lake. Tables I and II give a summary of the data obtained.

OYSTER DIVISION

TABLE I

Dredge Sampling showing density of oysters 7/8/55

Location of Sample	Salinity gram mille	Live Oysters		Shells Bu.	No. Drills	Drill Eggs
		No.	Bush.			
Old Reef S. E. of Camp	22.2	7		2.78	14	Yes
Old Reef S. of Camp	20.8	0		1.00	6	Yes
Shore West of Camp (Walker's Point)	19.0	561	1.00	1.00	3	No
N. End of Lake on Planted Shells	18.0	474	1.30	2.80	0	0
Front of Camp Near Channel	20.6	568	1.20	1.05	0	0
Bay N. E. of Camp on Planted Shells	17.8	293	0.85	1.00	0	0

TABLE II

Dredge Sampling, Dec. 22 & 23, 1955. Showing Size Groups and Mortality.

	No. Samples	No. Live Oysters Taken					No. Bu. Shells	Percent Mortality
		0–1 in.	1–2 in.	2–3 in.	3–4 in.	4 in. plus		
N. Shore of Point on which camp located	2	1	13	29	21	3	25 bu.	3.00%
Shore E. of Grand Pass	2	0	0	0	0	0	0	0
Between Camp and Grand Pass	3	8	40	42	21	1	.75 bu.	0.00%
Between Camp and Walker's Point	3	20	50	68	19	2	.33 bu.	0.00%
Walker's Point Shore	4	11	58	113	16	0	.50 bu.	0.00%
Pelican Leases to S. Shore	1	7	39	107	56	6	.33 bu.	1.80%
Camp to Pelican Leases	1	19	31	33	5	1	.66 bu.	26.90%
Off Shore W. of Grand Pass	3	27	66	11	6	0	.40 bu.	1.90%
Pass to Camp	1	12	44	99	46	10	.40 bu.	5.20%
TOTAL	20	105	341	502	190	23	3.62 bu.	
PERCENT		9.05%	29.3%	43.2%	16.3%	1.90%		

The general impression received from all samples and observations is that the extent of oyster producing bottom in the lake is small when compared to past years and that it is gradually being reduced by the northward movement of oyster drills as salinities increase. For example, in Table I only seven (7) live oysters were taken in three or four hours of dredging on the natural reefs in the southeastern part of the lake, where once most of the production occurred, yet at Walker's point only a mile or so north there is a density of more than 500 oysters per bushel.

The condition of those oysters from productive bottoms, however, is good. Evidence of serious disease is nil and the percentage of mortality is quite low being less than 5.0 per cent except in one case where a 26.0 per cent mortality was found in one sample. (Table II)

Table II gives the average size of the oysters found in the lake and the per cent of each size group. The largest age group is from two inches to three inches which makes up 43.2 per cent of the population. The one to two inch oyster group is next highest, followed by the larger three to four inch size. This age or size is approximately normal since most of the oysters on the reefs should be from 12 to 18 months old. This is based on the fact that the lake was thoroughly dredged during the winter season of 1953-54. (Dredging was stopped in January 1954 after some 90,000 barrels were removed.) This being the case the bulk of the oysters now available were set in the spring of 1954 and 1955 and in the fall of 1954. Measurements, therefore, indicate normal growth for the period.

Estimating the present crop is difficult since studies were not made of past harvests. As pointed out earlier some 600 acres of bottom is producing to some extent. In areas north and west of the camp where shells were planted, the oysters are scattered and appear sparse. This, however, may be a false picture because a small test dredge does not always work well. In front of the camp and along the western shore of the lake from Walker's Point north, and along the Main Channel oysters are considerably more numerous on the shell bottoms. The total population at present should be at least as great as in 1953 (90,000 barrels) and if an average of 200 to 300 barrels per acre is obtained as much as 150,000 barrels may be available. This, of course, includes oysters of all sizes. If only market size is selected the production could be considerably lower.

Spatfall—1954 and 1955

The total number of spat setting in Sister Lake in 1955 would appear to be less than 1954. (See percentage of size groups Table II.) This, however, could be of little significance since in southern waters more than enough spat are usually produced and this if further reinforced by a fall setting. The significant factor concerning spatting in Sister Lake is increased salinities which will decrease spatting and greatly increase predation by drills. At this date because of high salinities in 1954 and 1955 (Table III) drills have been on the increase in the main body of the lake and are serious predators of spat south of a line between Walker's Point and the Sister Lake Camp point. (See map.) This is evidenced by the total absence of spat and/or slipper clams on exposed shells dredged from the south section of the lake in July 1955, while in closed shells with enough opening to allow setting and exclude drills, setting was good. (See photograph I.) In the north half of the lake where drills are sparse or absent, spatting and slipper clams occurred on exposed shells. (Photograph II.)

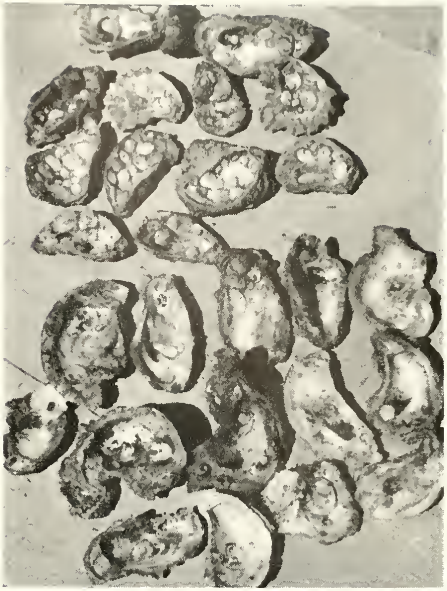


Photo I—Evidence of drill damage on spat and slipper clams. Top section shows one half of partially open boxes protected from drills by narrow opening. Note heavy growth of spat and clams. Bottom section, half shells exposed to drills show no spat or clams.

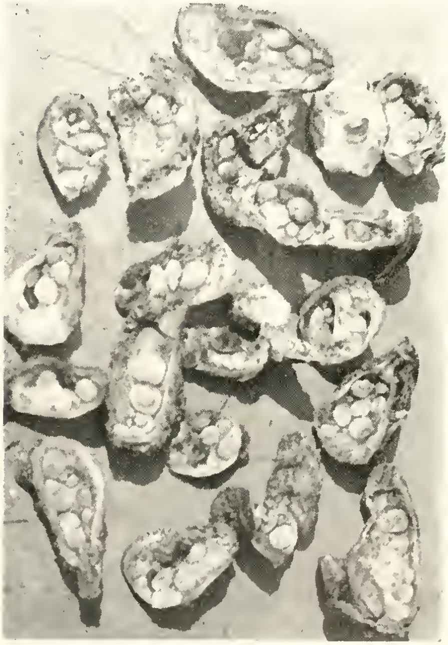


Photo II—Spat and slipper clams growth on half shells in area where no drills occurred. Compare with bottom half of photo.

It is also evident that more bottom area could be shelled in order to increase the area for spatting. Various densities of shell planting should be tried in order to determine the best way to plant shells.

Saline Conditions in Sister Lake

An optimum environment for oyster growth in Louisiana would be one of low salinities (below 14.0 parts per thousand) from late March through September of each year and high salinities from October through February. This would allow for maximum spatfall, minimal disease, eliminate drills, and result in maximal winter growth. Such conditions rarely occur in Louisiana waters and the best substitute is a low saline area for spatting and early growth, then removal of seed to a high saline area for rapid growth before marketing. For a seed ground area one of generally low salinities averaging below 14.0 parts per thousand salt particularly in spring and summer is needed to control drills and disease. Such conditions once occurred in Sister Lake, but the lake now seems to be changing to a high saline environment. Table III clearly indicates that since October 1953 salinities most months have been well above the minimal 14.0 p/p/mille necessary to control or eliminate drills and drills have now invaded as far north as Walker's Point. (See map.) If such high salinities continue for another 18 months there is every reason to predict that drills will take over the entire lake and virtually eliminate it as a seed ground area. If, however, several months of low salinities should occur in the spring and summer of 1956 drills would be greatly reduced or eliminated for several years.

The exact cause of the increasing salinities is not yet completely determined. The range of mean monthly salinities available (Table III) needs to be thoroughly examined and compared to past weather data, dates of changes in drainage and the damming of certain fresh water outlets leading into Sister Lake. This is the next step in the study. Several reasons for high salinities must be considered and analyzed. These include

1. The possibility of increased salinities due to several dry years. If this is true the condition is cyclic and the salinities of the lake may be expected to return to normal during a wet cycle.
2. Changes in the drainage may be the basic cause. Some evidence is available to indicate that flood control along the lower Atchafalaya River and the prevention of back waters may be involved plus the fact that local drainage is now diverted away from Bayou de Large.
3. The establishment of at least two dams in freshwater bayous may be directly involved. The principal dam is one built by a local land owner, in a distributary of Bayou de Large that once furnished fresh water directly to the eastern end of the lake. The salinity differential on each side of the dam is as much as eight to 10 parts per thousand. (See map.)
4. A natural transition of less salt to greater salt because of geologic changes in the coast line and sinking. This seems unlikely because of the rapidity of the changes reflected in the data during the past four years. (Table III)
5. The probability that a combination of two or more of the above factors are acting to cause the salinity changes.

TABLE III

A Comparison of average monthly salinities in Sister Lake. Nov. 1950 - Dec. 1955

Year	January	February	March	April	May	June	July	August	September	October	November	December
1950	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14.0	11.5
1951	10.5*	11.6	11.3	5.1	11.6	9.2	9.1	7.5	11.9	15.2	12.4	17.9
1952	17.1	10.1	10.0	9.0	8.6	11.3	16.7	12.2	19.5	19.7	21.8	21.9
1953	11.7	12.3	16.9	16.4	22.0	18.0	9.6	8.7	14.5	20.9	18.2	9.8
1954	11.7	16.6	16.8	25.3	24.7	22.9	16.4	16.1	24.9	25.9	22.2	18.1
1955	13.6	17.1†	22.3	23.0	17.8	15.9	15.1	10.4	17.2	19.5	19.3	18.8

*All salinities recorded in parts per thousand.

†Short data.

Note: Salinities over 14.0 parts per thousand allow invasion of the oyster drill (THAIS).

Recommendation of Changes Which Should Alleviate Partially or Entirely High Saline Conditions:

Practically all of the fresh water entering Sister Lake comes from Bayou de Large and Lake Mechant via Grand Pass. Current studies in the area indicate that most of this water passes out the channel and affects only the north and northwestern section of the lake.

1. Originally the eastern half of the lake received its supply of fresh water from a distributary of Bayou de Large. This distributary was dammed in recent years. Salinity differential on either side of the dam indicates that considerable fresh water must have flooded the east half of the lake from this source on outgoing tides. Replacement of this dam by a bridge or large culverts should reestablish a supply of fresh water to the east half of the lake.
2. Bayou de Large is the principal source of fresh water for the lake. It does not now have the volume of flow as in past years because of efficient drainage measures established along its upper reaches. Water levels established between the intracoastal canal and Bayou de Large indicate a differential of four inches to one foot depending on water stages in the intracoastal. If Bayou de Large could be opened into the intracoastal system considerable fresh water would be added to the lake.
3. Some fresh water enters the lake from the Lake Mechant area, particularly during high stages of the Atchafalaya. The Mauvais Bois ridge, however, is an effective barrier for flows southward during normal years. If cuts or canals could be made in this ridge possibly more fresh water could reach Sister Lake.
4. The proposed Interstate Pipe Line Canal will pass just north of Mechant and Sister Lakes. Careful placement of spoil may in some way increase the amount of fresh water entering the lake.

Barges being towed to experimental planting area.

General Conclusions

Preliminary studies of Sister Lake have been completed. Following is a summary of the principal findings.

1. Oyster production in Sister Lake is declining with only 600 acres of producing bottom in the 6,000-acre area.
2. Practically all oyster production is confined to the north end of the lake where fresh water is available and drills are absent.
3. Salinities have shown a marked increase during 1954-55 and oyster drills may be expected to increase unless it becomes lower.
4. The greatest percentage of oysters in the lake are between one and three inches in length.
5. In order to increase production in the lake more fresh water and additional shell bedding is needed.
6. The east half of the lake would probably be aided greatly if a dam in one branch of Bayou de Large was substituted with a bridge.
7. More fresh water would be added to the area if Bayou de Large was opened into the intracoastal canal.

Investigations of Basic Oyster Biology and Ecology

As pointed out earlier in this report, it is necessary that we know the normal biology and ecology of the oyster in Louisiana waters before abnormal conditions can be accurately and rapidly investigated and assessed. In the opinion of the Chief Biologist, this phase of work should be stressed and should make up most of the investigative program during the first three to five years of the program. Because of the great demand made of the biologists to handle complaints, however, this phase of the work is only now being organized.

A. Experimental Oyster Beds

One of the first steps taken toward basic investigations was to set up four experimental oyster beds. These beds were planted by oystermen according to their normal procedure and were set up in areas of both high and low summer mortality. As these beds develop through a complete cycle of production detailed biological and ecological studies will be made of the oysters on the reefs and of the area. These investigations will include data on growth, mortality, quality, disease, predation, water and bottom chemistry, oyster food, hydrographic and weather changes. It is hoped that at one site a floating laboratory will be set up at the experimental bed so that daily studies may be made. At the time of this writing four beds have been established and initial data is being gathered. Preparations are now being made to outfit the small floating laboratory.

B. General Hydrographic Studies

Of prime importance to an oyster research program as well as to all types of marine investigations is a continuous hydrographic study of Louisiana's coastal waters. An attempt is being made to set up such a study which will include a specially equipped boat and the collection of various types of hydrographic data on a permanent schedule. To date most hydrographic data is a result of material collected on field trips for other purposes and is not complete or adequate.

C. Need for Marine Laboratory

One of the principal needs for a well-rounded and complete oyster and marine research program is a centrally located and well equipped marine laboratory and headquarters. Unless such an establishment is set up the program will be greatly handicapped if not almost completely inhibited. A laboratory is needed to make the necessary controlled experiments in order to verify the trends discovered in field investigations. It is important in the study of the control of disease and predation of oysters, the effects of pollution, and the physiological and microscopic changes which occur in oysters under various conditions in the field. Also of great importance is a headquarters site at which can be stored field equipment and from which controlled field experiments can be examined daily. Much of the field work already done on pollution from oil is now awaiting final verification under controlled laboratory conditions. Until such work is done the complete pollution picture will not be known nor will it be possible to develop adequate preventative measures.

Oyster drills (Thais floridana) culled from seed oysters.

Cooperation with L. S. U. Research

The Biochemistry Department of Louisiana State University is carrying out basic chemical studies of oysters with respect to quality at various times of the year and with respect to the best method of preserving oysters. The work is being directed by Dr. E. A. Fieger and is financed with Saltonstal funds.

The biological section of the Oyster Division has worked in close cooperation with this research group and has furnished monthly oyster samples from various areas of the coast for chemical analysis. Plans are now in process to undertake a more detailed chemical analysis of samples from our experimental beds. Results from this work will be highly significant. As a result of this cooperative effort findings of the L. S. U. research group are being made available to the Wild Life and Fisheries Commission so that they may be used in furthering the oyster industry.

Oyster Production in Relation to Expanding Mineral and Industrial Operations in Coastal Areas

The ever expanding industrial empire, particularly mineral, along the Louisiana coast has created a vast array of problems in the oyster industry. These problems, in general, fall into two main categories each of which may be subdivided into several classes as follows:

1. Direct effects of mineral operations and attendent construction.
    a. Oil or other type pollution causing oily unmarketable oysters.
    b. Possible direct mortality from toxic waste.
    c. Mortality of oysters and destruction of leases from silting due to dredging or propeller action.
    d. Direct damage or loss from seismic operations.

   - e. General disturbance and traffic in shallow oyster areas.
   - f. Conflict of leases.
   - g. Destruction of beds by dredging.

2. Indirect effects of industrial operations principally on the ecology of the oysters and the normal hydrography of the coastal areas.
   - a. Increased salinities from canaling and leveeing.
   - b. Changing of current rates and direction of flow.
   - c. Changes in the frequency and amplitude of cyclic water levels.
   - d. Indirect silting in catch basins behind improperly placed spoil banks.

Of the two categories of problems listed above the direct affect of industrial operations causes more concern to the individual oystermen and in turn results in more complaints to and work for the biological section. Such complaints as oily taste in oysters, mortalities, silting, destruction of leases, etc., have utilized most of the time during the first year of operation of the biological section and will probably keep one or more field crews in constant demand. While the work done in this respect is generally successful and of considerable help to the individual oysterman who complains, **it is at best a stop gap and can never hope to produce the much needed answers that controlled undisturbed research will produce in time.** The most needed work falls in the category of basic oyster biology as it is related to the changing environment with emphasis on producing quality oysters in spite of changes.

Two major problems have occupied much of the biological sections time during 1955. These are, (1) Investigating the many complaints of damage and mortality and (2) Studying the effect of seismic operations under present regulations. These are discussed in the remainder of this report.

A. Investigation of Problems on Individual Reefs Resulting from Industrial Progress

The fact that 24 complaints involving 26 or more cases of industrial damage to oyster leases have occurred within 10 months indicates the magnitude of this type work as well as the general conflict between other industries and the oyster industry. Of the 24 complaints of damage 13 involved oily taste in oysters, 3 involved mortality from silting, 4 involved destruction of all or part of the lease either by dredging or construction within the lease area, 2 involved undeterminable mortalities and 2 were associated with seismic operations. Table IV summarizes the principal types of damage and the location of most of the trouble.

Commission biologists, Dr. Lyle S. St. Amant and Andrew V. Friedricks, Jr., of the Oysters and Water Bottoms Division, and Theodore B. Ford of the River Basins Study Section, examine a chart aboard a barge laboratory located in the Barataria Bay marsh near experimental oyster reefs.

OYSTER DIVISION

TABLE IV

Type and disposition of Projects involving damage to Oyster by Industrial Advancement.

Project No.	Nature of Complaint	General Location	Factor Involved in Contamination or Mortality	Remarks
A	Oily taste—mortality	Lake Robinson	Oil emulsion mud cuttings; considerable silting.	This area still contaminated after 12 mos.
B	Oil taste—unmarketable	Barataria Bay	Oil emulsion mud cuttings contaminated 5 leases.	This area fairly well clear of contamination in 6 mos.
C	Mortality from silting	Lake Grand Ecaille	Silt from dredging operation.	Mortalities slightly above normal, evidence of spotty mortality.
D	Mortality Seismic Op.	Barataria Bay	Claimed Seismic shots made in bed.	Mortality on bed greater than normal, not enough evidence on exam.
E	Mortality oily taste	Timbalier Bay	Factors absent at time of examination.	No positive results obtained—mortality possibly D. marinum.
F	Oily taste—mortality	Four I. Bayou	Oil emulsion mud cuttings and silting of beds.	Obvious contamination—high oil content. Oysters condemned.
G	Damage to reef—oil well and pipe line	Lake Grand Ecaille	Conflict in leases—oil wells drilled in bed.	
H	Oily taste	Billich Bay	Pipe line break—heavy slick	Contamination occurred but was cleared up in 30-60 days.
I	Destruction of lease by dredges	Point-au-Fer	Shell dredge operating in lease.	Conflict of leases.
J	Mortality—silting	Lake Barre	No factors involving silting or oil present.	Heavy mortality—apparently from D. marinum.
K	Mortality damage to reef	Am. Bay	Canal dredged into lease.	Obvious damage.
L	Mortality damage to reef	Bayou Pierre Lee	Dragline operating on reef.	Obvious damage.
M	Mortality, silting oily taste	Lake Robinson	Silting from dredging; oil pollution.	Extensive damage.
N	Oily taste—oily slick	Bayou Bleu	Oil slicks reported frequently.	Oysters only slightly oily when examined.
O	Oily taste	Terrebonne Bay	Oil emulsion mud spillage two wells involved.	Strong oil taste unmarketable.
P	Mortality—oily taste	Mud Lake	Drilled near bed oil base mud spilled.	Examined too long after contamination, strong evidence of past mortality.
Q	Mortality	Barataria Bay	Oil operation, silting.	Evidence of high mortality, cause not clear.
R	Mortality	Barataria Bay	Oil operation, silting.	Evidence of high mortality, cause not clear.
S	Oily taste	Bayou St. Dennis	Wave wash and waste oil from boats.	Not oily when examined.
T	Oily taste	Bay Tambour	Oil spillage.	Not oily at examination.
U	Oily taste		Spillage wave wash.	Distinct oil taste.
V	Mortality—Seismic	Scofield Bay.	Seismic operation too far to be significant.	High summer mortality D. marinum.

Of considerable importance was the discovery by the biological section that oil based muds, oil emulsion muds, and oily well cuttings were principally responsible for most of the oil taste in oysters. Furthermore that this type of contamination was less likely to be detected until too late and would continue to contaminate areas for long periods of time. The importance of these findings can best be understood when it is realized that wells, apparently clean (i.e. no waste oil or oil slicks) upon being checked by waste control inspectors, were still contaminating oyster reefs. Also of significance is the fact that such types of contamination may be evident in open bays for a radius of 3,000 feet around a well and in narrow channels for one or two miles. These findings resulted in a more rigid application and enforcement of Stream Control Commission regulations which should in time result in less oil contamination.

Next in importance to this work have been efforts made to prevent damage before it occurs. The accompanying photographs illustrate damage to oyster areas from dredging and improper spoil placement. This, in part, was due to a lack of awareness of the part of the construction agency who failed to locate oyster reefs in advance and to determine the possible damage that might occur. Now all permits are examined in advance and oystermen and construction companies are notified of possible damage in time to prevent its occurrence. The principal breakdown in this system is the fact that much construction is done on continuous permits or is completed before the biological section can analyze the plan and predict the damage.

B. Investigation of the Effects of Seismic Operations on Oyster Production

Although experiments have been carried out by competent scientists which indicate that explosive blasts have little immediate or latent effect on oysters, constant complaints by oystermen would lead one to believe that perhaps the problem has not been completely explored. With this in mind certain observations and investigations have been set up to be carried out over the next 18 months. It is hoped that some definite information will be obtained about the effect of extensive seismic operations in our coastal waters.

This study of the effects of seismic operations has been designed for the 18 months period October 1955 to April 1957. During this period it is planned to make a careful study of seismic effect over the annual cycle of oyster production in Louisiana. The general procedure to be followed is:

1. Seismic operations are to be observed closely in all oyster areas.
2. Oyster beds in the near vicinity of the shot points are being examined before and after operations to determine possible damage.
3. Certain beds nearest shot points are examined periodically after shooting in order to determine possible latent effects.
4. Several experimental beds planted on various types of bottoms are being closely studied and when considered growing normally will be subjected to seismic blasts.
5. Some data has been secured on blast effects and more elaborate experiments are planned.
6. It is expected that the maximum field work will be carried out in the Spring, Summer and Fall of 1956.

At this time not enough work has been done to present data on seismic experiments but data analysis is kept current and information may be obtained by contacting the writer at the Louisiana Wild Life and Fisheries Commission's office.

C. Effects of Suspended Explosives on Off Shore Bottoms

Considerable concern and complaint has been expressed by trawl fishermen along Louisiana's coast concerning the loss of fishing gear on mudlumps and bottom obstructions alleged to have been caused by seismic explosions. Therefore, it was decided to make preliminary studies of such seismic operations when at the Commission meeting of April 18, 1955, a request was made by the Geomarine Service, Inc., to carry out certain seismic operations in the East Bay area. Said operations to involve refraction shots up to 1,000 pounds of explosive in a pattern around a test well in order to properly map the extent of the existing salt dome. Since the amount of explosive to be used was far in excess of that allowed by present seismic regulations, permission was granted only for experimental shots the effects of which to be carefully studied by technicians of the Wild Life and Fisheries Commission. These studies were made by the Commercial Seafood Division and the Oysters and Water Bottoms Division on Sunday and Monday, May 1 and 2. Attached are the detailed results of the preliminary study.

The general method used to make the study involved a careful marking of the shot site before and immediately after the shot. Depth recording apparatus sensitive to a six-inch variation, was then used to examine the bottom. In addition, soundings of the bottom were made and the bottom type noted.

Pertinent Remarks

The only bad and damaging effect of seismic explosions on the bottom of the sea occurred when a charge was fired on the bottom. All suspended charges had little apparent effect—no craters—no lumps.

The bottom characteristics were noted by armed sounding lead and logged at each shot point.

It is possible that the bottom type influences the blast effect to a measurable degree.

By sounding before the shot and sounding immediately following the shot it was noticed that the mud-sand ratio changed somewhat.

Fish Mortality:

Fish mortality was inconsequential. There was no apparent effect on large or even on harvestable fishes. The effect of the blast appears to be only upon larval and very small fishes.

Mortalities among anchovy were noticed at ranges up to 500 feet and several large fish were seen leaping at ranges exceeding 500 feet.

After one shot a crab was seen swimming with no apparent effect within 25 feet of the shot.

Conclusions:

In water 25 feet and greater and of mud-sand character—suspended charges even up to 1,000 pounds *have no effect* on the bottom if fired in mid-water and the present regulations are well founded.

With the equipment used, no evidence could be found which indicated a change in bottom character, the formation of craters or lumps, when suspended charges were used. All suspended shots were in 30 or more feet of water which afforded at least a 15-foot cushion of water between the charge and the bottom.

Character of Charges and Depth Exploded
Sunday 5/1/55

Shot Pt.	Distance from hole	Depth Water	Charge lb.	Charge Depth	Erg. Rec.
No. 1	1000 N.W.	30′	$16\frac{2}{3}$	15′	O. K.
No. 1	1000 N.W.	30′	$16\frac{2}{3}$	15′	O. K.
No. 2	5000 N.W.	32′	$16\frac{2}{3}$	15′	N. G.
No. 2	5000 N.W.	30′	30	15′	N. G.

Character of Charges and Depth Exploded
Monday 5/2/55

Shot Pt.	Ft. from Well	Depth Water	Bottom	Charge lb.	Depth of Shot	Change in Bottom	Erg. Rec.
A-1	1000′	30′	M. S.	$16\frac{2}{3}$	Susp. 15′	No	O. K.
A-1-B	1000′	30′	M. S.	$16\frac{2}{3}$	Susp. 15′	No	O. K.
A-2	5000′	30′	M. S.	30	Susp. 15′	No	O. K.
A-3	10000′	31′	M. S.	50	Susp. 15′	No	O. K.
A-3-B	10000′	31′	M. S.	50	Susp. 15′	No	O. K.
A-4	15000′	31′	M. S.	50	Susp. 15′	No	O. K.
A-5	20000′	32′	hrd. S.	50	Susp. 15′	. . .	N. G.
A-6	25000′	32′	hrd. S.	100	Susp. 15′	No	O. K.
A-7	30000′	33′	stk. M. S.	200	Btm. Shot	Yes 4′	O. K.
B-15	30000′	37′	M. S.	300	Susp. 20′	. . . . .	O. K.
C-15	30000′	39′	sft. M. S.	300	Susp. 20′	No	O. K.
D-15	30000′	42′	M. S.	300	Susp. 20′	No	O. K.
E-15	30000′	40′	hrd. S.	300	Susp. 20′	. . . . .	O. K.
F-15	30000′	35′		300	Susp. 20′	Yes	O. K.

M. S.	Mud-Sand
hrd. S.	Hard Sand
stk. M. S.	Sticky Mud-Sand
sft. M. S.	Soft Mud-Sand

These experiments do not indicate what might happen in shallower water where the charge would be nearer than 15 foot to the bottom.

In one experiment a 200-pound charge was fired directly on the bottom as a reference and control study. The results in this case indicated definite evidence of two four-foot high mud lumps with apparently a trench of undetermined depths in between. The entire affected area was approximately 20 feet long by 12 feet wide.

Fish mortality in all experiments was apparently negligible. No large fish were seen or noted in distress. Numerous small fish, silver anchovies, were killed by the blast. One eel was also collected.

The conclusions which may be drawn from this preliminary experiment tend to indicate the following.

1. Shots up to 1,000 pounds when suspended at least 15 feet from the bottom had no effect detectable with the instrument used.
2. Shots directly on the bottom will cause mud lumps and holes of sufficient size and character to damage fishing gear.
3. These experiments were carried out over a relatively firm mud and sand bottom and do not necessarily indicate that the same results would be obtained on other bottom types.
4. It is recommended that further studies be made on a variety of bottom types and that standard size trawls be dragged through the shot point immediately after shooting as a final test of the effect of suspended charges.

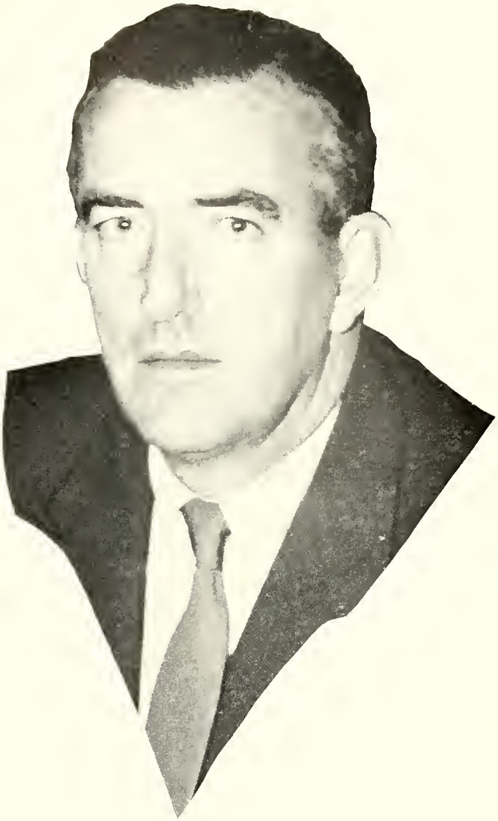
Division of
Water Pollution Control

By K. E. Biglane, *Biologist*

The Dark Ages of Pollution are over. Such rapid advances have been made in the last decade that the science of waste control can now be rightfully included in the list of exact sciences. Our yardsticks for measuring damages wrought by uncontrolled discharges into the state's waters are becoming increasingly more accurate.

As in every science, pollution control once floundered in a sea of ignorance. Black swamp water was once thought to contain certain "miasmas" which caused fatal diseases. Therefore, it followed that every industry whose discharge resembled black swamp water constituted a public health menace. Actually, these discharges were more of a menace to the aquatic inhabitants of the stream. As soon as corrective measures such as impoundment, dilution, or waste water reuse inside the industry was begun, it was found that we could still operate the industry, alleviate the damages to aquatic life, and eliminate any public health hazard that the waste discharge might have.

The casual observer sometimes asks, "Why all this concern about a few polluted streams in our state?" "Doesn't Louisiana have more than enough streams so that some can be used for waste disposal and the rest for fishing and recreation?" Many states, to their sorrow, have rested on this and similar assumptions and now their entire economy is threatened by a lack of potable drinking water and water suitable for industrial use. In these states, cities located on the banks of certain rivers impose such a use load on these streams that it has been calculated that at times a drop of water entering the city limits has been used as many as 10 times.



Frank J. Coogan, Chief

Fortunately, Louisiana's Division of Water Pollution Control and the Louisiana Stream Control Commission recognize that industrial expansion in the South is progressing at a pace heretofore unknown. For this reason, these two groups have worked diligently toward insuring a source of potable water for every industry that may make application for establishment.

Major Problem

One of the major problems in stream enforcement is the one dealing with industries that have been operating for more than 20 years. These industries have been allowed to discharge any and everything, in as much quantity as they desired. When approached by our technical staff and asked to clear up and take the necessary steps to alleviate the damages done by waste discharge some of them take an attitude of righteous indignance. Of these few who have done so we have found that the best method of solving the problem is by offering consultary advice and working in close cooperation with the management and technical staff.

The gathering of technical data on a polluted stream does not necessarily include economical aspects with regard to losses by commercial and sports fisheries as opposed to costs of expensive impoundment installations by an offending industry. For this reason, our efforts to eliminate pollution in a stream are often misinterpreted by a few who think we intend to close them down. Questions from the industry as to the feasability of their being "shut in" and throwing thousands of state citizens out of work just so "a few fish can live" are not asked by those far sighted managements who know that someday their's will not be the only plant on the stream.

In Baton Rouge the concentrated industries along the east bank of the Mississippi River are practicing the "close neighbor should be a clean neighbor" policy. It would be sad indeed if the most upstream plant poured out a discharge so foul as to render the water unusable for its downstream associates.

This, then is the ultimate aim of Louisiana's Division of Water Pollution Control and the Stream Control Commission, to keep the streams in all of Louisiana in a classification of good water quality.

Commission Set Up

Louisiana's anti-pollution body was set up by the Stream Control Act of 1940. This act provides a six-man commission for the abatement of pollution and is headed by the Director of the Louisiana Wild Life and Fisheries Commission. The five other members of this commission include representatives of the State Department of Commerce and Industry, Department of Public Health, Department of Agriculture and Immigration, the Attorney General's Office and the Department of Conservation. The Division of Water Pollution Control, a division in the Louisiana Wild Life and Fisheries Commission, acts as the fact-finding body for the Stream Control Commission. The chief of the Division of Water Pollution Control also serves as secretary and technical advisor to the Stream Control Commission. The act states that the Wild Life and Fisheries Commission shall enforce the rules, regulations and orders of the Stream Control Commission.

After such evidences are gathered that indicate pollution of a stream by a particular industry, information to that effect is submitted to the Stream Control Commission at its regular monthly meeting. Acting on this information the Stream Control Commission directs that a Notice of Determination be served on the offender. This notice directs the industry to file with the Commission, within 10 days, a statement, setting forth in detail just what steps have been taken or are being taken to abate the pollution.

Following the receipt of this information the Commission then decides if procedures outlined by the industry will be sufficient to abate the pollution or if some other restrictive order should be served on a responsible official of the company concerned.

There are various types of restrictive orders that can and have been written; orders setting forth the biochemical oxygen demand that can be discharged to a water course per day, orders limiting the amounts of the various components of a waste to be discharged. These orders are always dependent upon the type of waste discharged by the manufacturing establishments involved.

Kenneth E. Biglane, biologist, Water Pollution Control Division, who was named temporary division chief following the resignation of Frank J. Coogan in January 1956.

In any order written the two main requirements are: First, it must be reasonable, and second, it must be technically correct.

The reasonableness requirement is an absolute necessity if the order is to stand the scrutiny of the courts. The second requirement stands as self-explanatory. Orders containing erroneous or incorrect calculations would be worse than no orders at all.

The punitive section of the Stream Control Commission Act states that any person or company convicted of violating the Stream Control Commission rules, regulations or orders would be subject to a fine and a possible jail sentence.

Staff Is Listed

The technical personnel of the Division presently consists of a chief, three aquatic biologists, an engineer, and five waste disposal inspectors. These personnel are strategically located throughout the state so as to make immediate investigations of fish mortalities suspected of being caused by pollution.

During the biennium, a plan was submitted to the Director of the Wild Life and Fisheries Commission whereby the state was divided into three aquatic districts. Each district is to be supervised by a biologist and he is directly responsible for the detailed knowledge of every water-shed in the district and every industry located on these water-sheds. Such a plan would concentrate the scope of study by the technical staff and result in a more comprehensive knowledge of every state stream.

The Division of Water Pollution Control is concerned with three major types of pollution. They are organic, inorganic, and silt. These three types are similar only in the respect that ultimately, each renders a stream unfit for domestic, recreational, or industrial use and each effects a change of aquatic inhabitants.

Organic Pollution

This type of pollution is usually represented by those wastes which tend to deplete a stream of its oxygen. Examples of these wastes may be seen coming from sugar mills, food canning or processing plants, fish oil plants, domestic sewage outfalls, slaughterhouses, and paper mills.

Streams polluted by these wastes are physically characterized by foul odors and water discoloration.

Chemical characteristics of a stream polluted by these organic wastes usually include an alteration of the hydrogen-ion concentration, a reduction in the amount of dissolved oxygen available to fishes and other aquatic animals, and an increase in the amount of substance available for bacterial decomposition (B.O.D.).

Robert LaFleur, biologist, Water Pollution Control Division.

Other types of organic wastes are not of an oxygen depleting nature but are directly toxic. These wastes are found coming from chemical plants, wood creosoting plants, and also include plant and insect poisons. Many of these wastes are toxic in very small concentrations and therefore must be discharged with extreme caution.

Waste oil is an organic pollutant which may affect the stream in two ways. First, it may contain water soluble fractions that are toxic to the aquatic inhabitants; and second, it may become absorbed by silt particles, fall to the bottom and cover the small animals which are essential for fish foods.

Inorganic Wastes

In Louisiana, oil field brines are the worst offenders in the inorganic waste category. These wastes are particularly troublesome because they are produced daily in large quantities, they do not stabilize when impounded, require expensive preparation for proper disposal (ground injection) and are harmful to fish, small animals used by fishes for food, and all types of vegetation. Some brines carry potential acid forming substances in them which materially affects all of the stream inhabitants.

Stringent disposal measures have been imposed in the rice growing areas with regard to the disposal of brines. It has been found that during certain stages of rice growth, low level concentrations of salt water seriously affects the growth and potential yield of the rice crop.

Little River, a stream in Central Louisiana, has been detailedly investigated both biologically and chemically. This river receives oilfield brines and wastes from several fields located on or near its headwaters. Regular mediation with representatives of the oil industry in that area is beginning to show some promise of removing the brine load on Little River.

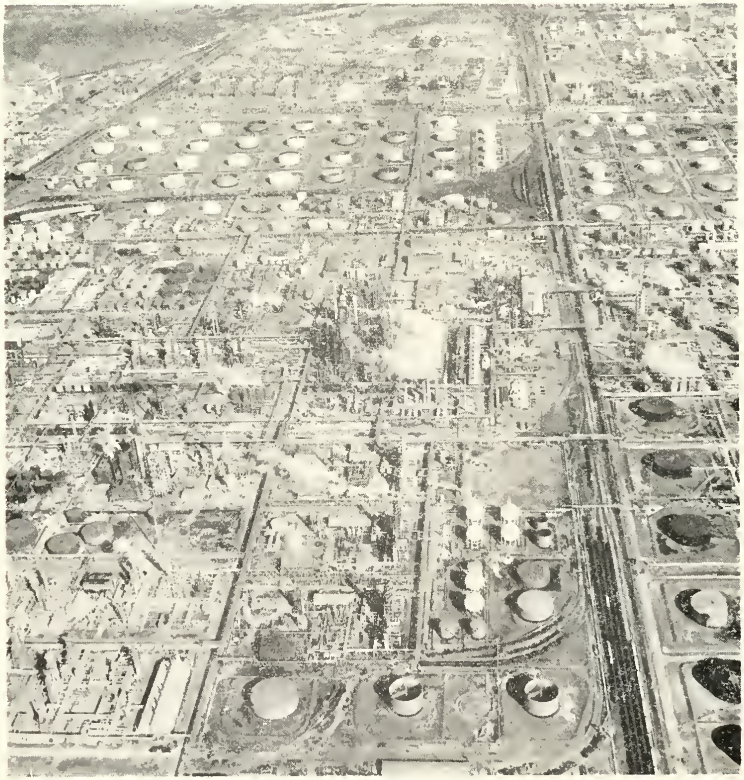
Silt Pollution

Although silt is not a discharge from a manufacturing plant, it does constitute a menace to our streams. This problem is found almost entirely in the Florida Parishes, but is not confined to them. Wild Life and Fisheries Rangers have been particularly helpful in discovering and eliminating silt pollution. These men visit gravel and sand mining operations located on streams during their routine enforcement duties and are able to report any change in the physical appearance of the water brought about by unlawful procedures of the dredging companies.

Silt pollution may affect a stream by covering the bottom organisms, covering fish nets and smothering the eggs, clogging the gills of fishes, and altering the course of the stream's flow by the deposition of large amounts of solids.

Field Investigations

An important phase in any stream abatement program is the field investigations performed by the biologists, engineers, and waste disposal inspectors. Installation of two-way car radio systems is underway in most of the field units. These systems will be particularly helpful when the tech-



Industries at Baton Rouge. Cooperation between industry and wildlife officials have meant the salvation of many of our streams. Many concerns have spent hundreds of thousands of dollars to control their disposal wastes, leaving lakes and streams clear for more and better fishing.

nical personnel in the field are needed for emergency calls and when a field man needs assistance or a specific piece of equipment.

All of the field men carry water testing equipment that enables them to determine if there has been a change in water quality, and often times, just this equipment alone is sufficient to supply the answers to unexplained fish kills or confirm the suspected potency of a waste.

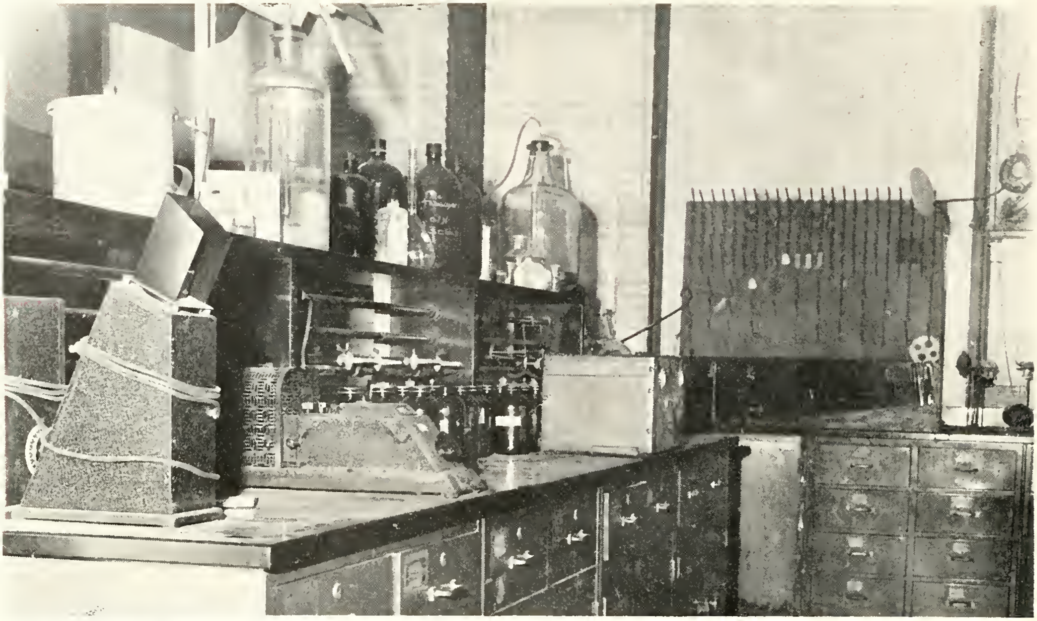
An underwater breathing apparatus was purchased last year and was used in both fresh and salt-water observations. This equipment will prove valuable in the study of fish populations, securing samples from any water level, and retrieving articles inadvertently lost overboard.

The division is well provided with sturdy work boats and good outboard motors. Considerable time is spent in the maintenance and care of all field equipment so as to keep it at maximum operating efficiency.

The addition of a 23 foot Chris Craft inboard greatly enhanced the coverage of our coastal wa-

Darrell B. Reed, Engineer, Walter Pollution Control.

Aerial view of Tullos-Urania oil field.



Part of laboratory equipment used by Water Pollution Control Division, Geology Building, L. S. U. campus, Baton Rouge.

Aerial view of industrial plants at Lake Charles (Westlake).

View of Springhill paper mill and impounding basin in background.

Southern Advance Mill and retention basin at Hodge, La.

ters. This boat is equipped with a two-way radio, a depth sounding apparatus and a portable power plant. A craft of this size is large enough to travel the offshore areas and small enough to work in some of the larger rivers and tributaries inside the state.

During this biennium, field investigations were conducted on almost every major watershed in Louisiana. To name a few: Pearl River, Amite River, Calcasieu River and its headwaters, Little River and its headwaters, Corney drainage basin, Caddo Lake, Black Bayou Lake, Bayou Teche, Bayou Lafourche, Vermilion River, Bogue Falaya River, and many lakes, farm ponds, and smaller streams throughout the state.

Laboratory Investigations

The technical personnel in this division performed the usual water and mud analysis which included five-day B.O.D., oil extractions, chlorides, nitrates and nitrites, color and turbities, and dissolved oxygen. In addition, they assisted in the analysis of oysters, water, and muds for the Division of Oysters and Water Bottoms.

Toxicity bioassay tests using the Bluegill, **Lepomis macrochirus,** as the experimental animal were performed with oil refinery wastes, ammonia plant wastes, algacides, insecticides, oil field brines, pine product plant wastes, and pure chemicals.

Technical Papers

Two technical papers were written and published during this biennium. They are as follows:

Coogan, F. J., Biglane, K. E., and Lafleur, R. A., "Index Organisms Used in Louisiana Stream Pollution Surveys." Presented at 37th Texas Water and Sewage Works Associations Short School—March, 1955, and Tenth Purdue Industrial Waste Conference, Purdue University, May, 1955.

Coogan, F. J. and E. B. Paille, "Physical and Chemical Characteristics of Waste Water Discharges from a Refinery." Industrial and Engineering Chemistry, Vol. 46 (1954) pp. 290.

Accounting and Revenue

Statistical and Accounting Reports

Since the operations of this Commission are based on income, it is necessary to keep an accurate and up-to-date tabulation of the various sources of revenue for present use and future planning. An appropriation from the Conservation Fund which is the money allotted for operation by the Legislature every year, is based on present income plus the projected estimated income.

This presentation is mostly in table form and is designed to give precise records and statistical data covering accounting reports including revenues and operations along with comparative revenue tabulations from prior periods, so that trends can be observed.

Since a large portion of the Commission's income is derived from industry, there are various statistical data pertaining to industries which come under Commission jurisdiction, such as shrimp production, oyster production, commercial fisheries, shell production and others.

In the Fifth Biennial Report it was pointed out that 1953 was the greatest revenue year on record. This should make the figures presented in Tables No. 1 and 2 even more impressive because both 1954 and 1955 show a remarkable increase over the prior year. In 1955 there was an increase of more than $780,000 over the year 1953.

Table No. 1
COMPARISON OF REVENUES
JANUARY THRU DEC. 1953 WITH JANUARY THRU DEC. 1954

Type of Revenue		Year 1953		Year 1954	1954	
					Increase	Decrease
Sev. Tax—Gravel		$ 325.80		$ 1,276.02	$ 950.22	$
Sev. Tax—Sand		1,583.90		1,715.94	132.04	
Sev. Tax—Skins, Hides & Furs		26,039.51		24,926.13		1,113.38
Sev. Tax—Oyster Privilege		22,003.42		18,362.89		3,640.53
Sev. Tax—Shrimp		77,310.19		77,246.22		63.97
Sev. Tax—Frogs		612.23		272.04		340.19
Angling Lic. New Orleans	$ 46,287.00	240,329.26	$ 54,159.00	256,863.33	16,534.07	
Angl. Lic. State Aud. Stat.	194,042.26		202,704.33			
Hunting Lic. New Orleans	18,967.00	453,981.61	17,719.75	433,610.04		20,371.57
Hunt. Lic. State Aud. Stat.	197,858.11		192,210.29			
Hunting Lic. Act 25 *	237,156.50		223,680.00			
Hunting Club		1,175.00		918.00		257.00
Com'l. Fishermen, Bait Sellers		13,180.00		13,510.00	330.00	
Hoop Nets		11,005.00		10,105.00		900.00
Fresh Water Com'l. Seines		2,515.00		2,175.00		340.00
Fresh Water Trammel Net		2,930.00		3,725.00	795.00	
Fresh Water Gill Nets		27,060.00		25,745.00		1,315.00
Salt Water Fish Seines		520.00		430.00		90.00
Salt Water Trammel Net		1,940.00		1,830.00		110.00
Wholesale Fish Dealer		19,300.00		20,200.00	900.00	
Wholesale Dealer's Agent		1,400.00		1,120.00		280.00
Retail Dealer		15,490.00		14,165.00		1,325.00
Oyster Vessel Tonnage		2,043.50		1,325.00		718.50
Salt Water Fish Vessel		405.00		380.00		25.00
Salt Water Shrimp Trawl & Vessel		56,375.00		54,295.00		2,080.00
Oyster Dredging		12,850.00		7,850.00		5,000.00
Salt Water Shrimp Seines		100.00		40.00		60.00
Salt Water Menhaden Seine & Vessel		6,200.00		6,800.00	600.00	
Salt Water Shrimp Freight		3,190.00		2,620.00		570.00
Game Breeders License		320.00		410.00	90.00	
Trappers Licenses New Orleans	266.00	8,661.63	355.00	8,586.74		74.89
Trappers Lic. State Aud. Stat.	8,395.63		8,231.74			
Resident Fur Buyers		3,975.00		3,675.00		300.00
Resident Fur Dealers		3,750.00		3,750.00		....
Non-Resident Fur Buyer		....		100.00	100.00	
Non-Resident Fur Dealer		300.00		300.00		....
Bedding Ground		45,941.00		42,341.00		3,600.00
Oyster Shop Resale		1,120.00		675.00		445.00
Bedding Ground Transfer of Lease		31.00		14.00		17.00
Dept. Reports, Other Publications		....		....		....
Misc. Refunds from Tax Collectors		....		.72	.72	
Royalty from Shells **		221,621.45		254,638.60	33,017.15	
TOTALS		$ 1,285,584.50		$ 1,295,996.67	$ 53,449.20	$ 43,037.03
TOTAL INCREASE	$ 10,412.17					
Royalties from Mineral Leases (State Aud. Stat.)		$ 477,415.60		$ 928,882.51	$451,436.91	
GRAND TOTALS		$ 1,763,030.10		$ 2,224,879.18	$504,886.11	$ 43,037.03
OVER ALL INCREASE	$461,849.08					

Table No. 2
COMPARISON OF REVENUES
JANUARY THRU DEC. 1954 WITH JANUARY THRU DEC. 1955

Type of Revenue		Year 1954		Year 1955	1955	
					Increase	Decrease
Sev. Tax—Gravel		$ 1,276.02		$ 264.75	$	$ 1,011.27
Sev. Tax—Sand		1,715.94		1,759.94	44.00	
Sev. Tax—Skins, Hides & Furs		24,926.13		29,150.06	4,223.93	
Sev. Tax—Oyster Privilege		18,362.89		13,966.12		4,396.77
Sev. Tax—Shrimp		77,246.22		64,029.93		13,216.29
Sev. Tax—Frogs		272.04		....		272.04
Angling Lic. New Orleans	$ 54,159.00	256,863.33	$ 42,254.00	267.571.92	10,708.59	
Angl. Lic.—State Aud. Stat.	202,704.33		225,317.92			
Hunting Lic.—New Orleans	17,719.75	433,610.04	17,790.50	464,560.63	30,950.59	
Hunt. Lic.—State Aud. Stat.	192,210.29		209,687.13			
Hunting Lic.—Act 25 *	223,680.00		237,083.00			
Hunting Club		918.00		820.00		98.00
Com'l. Fishermen, Bait Sellers		13,510.00		14,275.00	765.00	
Hoop Nets		10,105.00		10,025.00		80.00
Fresh Water Com'l. Seines		2,175.00		2,805.00	630.00	
Fresh Water Trammel Net		3,725.00		3,230.00		495.00
Fresh Water Gill Nets		25,745.00		21,935.00		3,810.00
Salt Water Fish Seines		430.00		515.00	85.00	
Salt Water Trammel Net		1,830.00		1,720.00		110.00
Wholesale Fish Dealer		20,200.00		17,750.00		2,450.00
Wholesale Dealer's Agent		1,120.00		1,000.00		120.00
Retail Dealer		14,165.00		16,095.00	1,930.00	
Oyster Vessel Tonnage		1,325.00		1,674.50	349.50	
Salt Water Fish Vessel		380.00		310.00		70.00
Salt Water Shrimp Trawl & Vessel		54,295.00		50,520.00		3,775.00
Oyster Dredging		7,850.00		9,900.00	2,050.00	
Salt Water Shrimp Seines		40.00		....		40.00
Salt Water Menhaden Seine & Vessel		6,800.00		5,500.00		1,300.00
Salt Water Shrimp Freight		2,620.00		2,370.00		250.00
Game Breeders License		410.00		510.00	100.00	
Trappers License	$ 355.00	8,586.74	$ 330.00	10,632.54	2,045.80	
Trappers Lic.—State Aud. Stat.	8,231.74		10,302.54			
Resident Fur Buyers		3,675.00		3,525.00		150.00
Resident Fur Dealers		3,750.00		2,850.00		900.00
Non-Resident Fur Buyer		100.00		100.00		
Non-Resident Fur Dealer		300.00		300.00		
Bedding Ground		42,341.00		53,454.00	11,113.00	
Oyster Shop, Resale		675.00		1,355.00	680.00	
Oyster Transfer of Lease		14.00		29.00	15.00	
Dept. Reports, Other Publications		....		....		
Misc. Refunds from Tax Collections		.72		23.25	22.53	
Royalty from Shells **		254,638.60		463,125.36	208,486.76	
TOTALS		$ 1,295,996.67		$ 1,537,652.00	$274,199.70	$ 32,544.37
TOTAL INCREASE	$241,655.33					
Royalties from Mineral Leases		928,882.51		1,007,629.09	78,746.58	
GRAND TOTAL		$ 2,224,879.18		$ 2,545,281.09	$352,946.28	$ 32,544.37
OVER ALL INCREASE	$320,401.91					

* Act 25 represents one-half of the Resident Hunting License collections and is dedicated to the enforcement of game laws (75%), and the improvement of the nesting grounds of migratory waterfowl (25%).

** Royalty from Shells is dedicated one-half to the operation of the Commercial Seafoods Division and one-half to Oyster Seed Grounds. Each of these divisions is presented in detail in other sections of this report.

The remainder of the revenues shown are turned over to the State Treasurer and placed in the Conservation Fund from which the Commission draws appropriation allotments for operations.

Table No. 3

STATEMENT OF LICENSES SOLD BY PARISHES FOR THE YEAR 1954

EXPLANATION OF NUMBERED COLUMNS

Column Number	Type of Licenses
1	Commercial Fresh Water Hoop Nets (15 nets allowed to operate under each license)
2	Commercial Fresh Water Fish Seines
3	Commercial Fish Producer
4	Commercial Fresh Water Trammel Nets
5	Commercial Fresh Water Fish Gill Nets
5-A	Salt Water rammel Nets and Seines
6	Wholesale Dealer
7	Wholesale Dealer's Agent
8	Retail Dealer

Parish	1	2	3	4	5	5-A	Total Netting	Per Cent Ea. Parish	6	7	8	Total
Acadia	21	2	36	6	21	1	87	.011	2	5	44	138
Allen	6	0	1	2	2	0	11	.001	0	0	11	22
Ascension	20	0	8	0	11	0	39	.005	3	3	17	62
Assumption	19	0	296	3	2	0	320	.040	5	12	17	354
Avoyelles	94	7	30	4	132	1	268	.033	7	1	52	328
Beauregard	14	0	25	0	24	0	63	.008	0	0	12	75
Bienville	6	0	6	22	66	0	100	.012	0	0	11	111
Bossier	4	0	8	7	60	0	79	.010	0	0	6	85
Caddo	78	3	57	21	230	0	389	.049	6	1	37	433
Calcasieu	26	6	93	5	72	18	220	.027	2	0	71	293
Caldwell	32	1	28	1	34	0	96	.012	1	0	3	100
Cameron	4	2	22	0	6	7	41	.005	5	0	6	52
Catahoula	173	14	30	16	189	0	422	.053	10	10	13	455
Claiborne	0	0	0	0	1	0	1	0	0	0	15	16
Concordia	55	2	22	3	56	0	138	.017	0	0	8	146
DeSoto	8	1	11	0	13	0	33	.004	0	0	10	43
East Baton Rouge	20	5	18	8	36	2	89	.011	10	1	193	293
East Carroll	18	5	20	20	115	0	178	.022	6	0	6	190
East Feliciana	0	0	0	0	0	0	0	0	0	0	10	10
Evangeline	45	1	12	6	8	0	72	.009	0	0	40	112
Franklin	77	12	19	7	99	1	215	.027	3	0	10	228
Grant	19	1	22	0	52	0	94	.012	0	0	12	106
Iberia	35	0	18	0	8	5	66	.008	16	2	23	107
Iberville	156	1	68	0	6	0	231	.029	11	2	16	260
Jackson	0	0	3	0	5	0	8	.001	0	0	16	24
Jefferson	1	2	77	1	2	13	96	.012	38	5	180	319
Jefferson Davis	18	2	59	1	24	0	104	.013	2	0	19	125
Lafayette	3	4	11	1	1	1	21	.003	4	0	58	83
Lafourche	0	0	86	0	0	2	88	.011	31	12	24	155
LaSalle	74	4	28	0	207	0	313	.039	3	3	3	322
Lincoln	1	0	0	0	0	0	1	0	0	0	8	9
Livingston	20	0	40	0	23	0	83	.010	1	0	27	111
Madison	9	2	5	4	38	0	58	.007	0	0	10	68
Morehouse	31	4	16	19	66	0	136	.017	1	0	13	150
Natchitoches	30	2	32	6	188	0	258	.032	1	0	28	287
Orleans	1	2	105	0	15	30	153	.019	54	11	982	1,200
Ouachita	81	11	61	28	110	0	291	.036	4	1	27	323
Plaquemines	26	0	21	0	0	23	70	.009	5	3	2	80
Pointe Coupee	27	6	30	3	53	0	119	.015	2	0	29	150
Rapides	45	4	40	15	165	0	269	.034	6	1	112	388
Red River	9	2	7	1	29	0	48	.006	1	0	4	53
Richland	27	0	19	9	63	0	118	.015	0	0	13	131
Sabine	18	0	21	2	19	0	60	.007	0	0	12	72
St. Bernard	1	0	20	0	0	8	29	.004	17	2	14	62
St. Charles	4	0	105	1	8	0	118	.015	2	1	22	143
St. Helena	1	0	0	0	1	0	2	0	0	0	0	2
St. James	1	0	11	0	1	0	13	.002	2	1	20	36
St. John	6	0	15	1	18	0	40	.005	2	0	36	78
St. Landry	90	4	100	12	51	0	257	.032	5	1	53	316
St. Martin	165	1	99	2	39	0	306	.038	4	12	28	350
St. Mary	153	10	425	7	55	5	655	.082	22	13	62	752
St. Tammany	6	0	93	2	2	40	143	.018	3	0	59	205
Tangipahoa	5	0	65	3	13	0	86	.011	9	0	66	161
Tensas	15	4	6	10	112	0	147	.018	1	0	2	150
Terrebonne	3	0	52	0	0	28	83	.011	78	8	47	216
Union	58	0	14	13	18	0	103	.013	1	0	7	111
Vermilion	11	0	12	0	4	7	34	.004	0	0	28	62
Vernon	3	0	50	0	20	0	73	.008	3	0	23	99
Washington	15	0	19	1	10	0	45	.006	1	0	46	92
Webster	29	0	15	2	94	0	140	.017	2	0	21	163
West Baton Rouge	11	2	6	0	7	0	26	.004	0	0	19	45
West Carroll	32	0	17	9	56	0	114	.015	3	0	4	121
West Feliciana	6	2	4	0	5	0	17	.002	0	0	11	28
Winn	9	0	19	1	4	0	33	.004	0	0	17	50
TOTALS	1,975	131	2,658	285	2,769	192	8,010	100%	395	111	2,795	11,311

Table No. 4

STATEMENT OF LICENSES SOLD BY PARISHES FOR THE YEAR 1955

EXPLANATION OF NUMBERED COLUMNS

Column Number	Type of Licenses
1	Commercial Fresh Water Hoop Nets (15 nets allowed to operate under each license)
2	Commercial Fresh Water Fish Seines
3	Commercial Fish Producer
4	Commercial Fresh Water Trammel Nets
5	Commercial Fresh Water Fish Gill Nets
5-A	Salt Water rammel Nets and Seines
6	Wholesale Dealer
7	Wholesale Dealer's Agent
8	Retail Dealer

Parish	1	2	3	4	5	5-A	Total Netting	Per Cent Ea. Parish	6	7	8	Total
Acadia	21	14	19	10	29	1	94	.011	2	2	34	132
Allen	13	0	1	2	2	0	18	.002	0	2	40	60
Ascension	28	0	16	2	5	0	51	.006	6	3	26	86
Assumption	12	0	230	1	7	0	250	.030	4	11	23	288
Avoyelles	72	11	51	9	98	1	242	.029	6	2	79	329
Beauregard	18	0	13	1	23	0	55	.007	3	0	21	79
Bienville	11	1	14	26	67	0	119	.014	1	0	22	142
Bossier	10	1	13	10	76	0	110	.013	1	0	36	147
Caddo	65	10	79	19	173	0	346	.041	5	1	141	493
Calcasieu	47	4	83	13	92	18	257	.031	3	0	132	392
Caldwell	17	1	23	0	20	0	61	.007	2	0	2	65
Cameron	0	1	12	0	11	7	31	.004	3	0	8	42
Catahoula	117	15	23	9	96	0	260	.031	9	8	5	282
Claiborne	0	0	1	0	1	0	2	0	0	0	13	15
Concordia	46	3	26	4	93	0	172	.021	0	1	5	178
DeSoto	13	2	19	0	23	0	57	.007	0	0	14	71
East Baton Rouge	35	1	21	4	58	2	121	.014	10	0	218	349
East Carroll	21	5	25	24	83	0	158	.019	3	0	8	169
East Feliciana	3	0	0	0	0	0	3	.001	0	0	8	11
Evangeline	32	3	13	15	5	0	68	.008	1	0	22	91
Franklin	66	11	14	9	73	1	174	.021	2	0	9	185
Grant	18	1	19	2	49	0	89	.011	0	0	12	101
Iberia	33	0	25	1	6	5	70	.008	2	2	31	105
Iberville	247	1	160	2	2	0	413	.049	13	7	21	453
Jackson	0	0	1	0	4	0	5	.001	0	0	18	23
Jefferson	2	1	92	1	3	13	112	.013	36	5	180	333
Jefferson Davis	20	4	73	1	34	0	132	.016	2	0	28	162
Lafayette	5	3	15	6	2	1	32	.004	3	0	50	85
Lafourche	4	0	87	0	2	2	95	.011	27	8	47	177
LaSalle	39	6	31	18	120	0	213	.025	2	2	8	226
Lincoln	3	1	0	1	1	0	6	.001	0	0	6	12
Livingston	13	0	37	0	54	0	104	.012	0	0	35	139
Madison	16	8	3	14	36	0	77	.009	0	0	11	88
Morehouse	46	6	13	23	70	0	158	.019	0	0	14	172
Natchitoches	28	4	35	29	165	0	261	.031	0	0	40	301
Orleans	5	4	119	0	10	32	170	.020	58	3	933	1,164
Ouachita	78	10	46	33	87	0	254	.030	3	1	26	284
Plaquemines	21	0	17	2	1	23	64	.008	6	0	4	74
Pointe Coupee	26	6	29	2	44	0	107	.013	1	0	55	163
Rapides	54	6	48	32	139	0	279	.034	7	0	141	427
Red River	11	2	7	0	38	0	58	.007	1	0	9	68
Richland	28	4	18	8	55	0	113	.013	0	0	11	124
Sabine	11	0	19	1	24	0	55	.008	0	0	12	67
St. Bernard	0	0	21	0	0	8	29	.003	9	7	20	65
St. Charles	6	6	138	0	7	0	157	.019	3	5	14	179
St. Helena	2	0	0	0	2	0	4	.001	0	0	0	4
St. James	2	0	13	0	4	0	19	.002	2	2	21	44
St. John	2	1	10	2	23	0	38	.005	0	0	29	67
St. Laudry	124	9	238	11	57	0	439	.053	4	1	68	512
St. Martin	119	1	73	1	87	0	281	.034	4	9	35	329
St. Mary	222	9	447	5	49	5	737	.089	24	13	90	864
St. Tammany	13	0	91	2	4	46	156	.019	1	0	60	217
Tangipahoa	11	0	84	0	18	0	113	.013	7	0	81	201
Tensas	16	3	7	14	142	0	182	.023	1	0	4	187
Terrebonne	4	0	46	0	0	29	79	.009	72	4	65	220
Union	54	0	15	17	27	0	113	.013	0	0	16	129
Vermilion	10	2	22	0	3	7	44	.005	8	0	26	78
Vernon	4	1	36	0	11	0	52	.006	1	0	25	78
Washington	24	0	18	0	4	0	46	.005	1	0	51	98
Webster	28	0	22	5	124	0	179	.021	0	2	28	209
West Baton Rouge	10	2	3	0	6	0	21	.002	0	0	10	31
West Carroll	36	2	9	11	59	0	117	.014	2	0	3	122
West Feliciana	5	0	2	2	0	0	9	.001	0	0	17	26
Winn	6	0	9	2	7	0	24	.003	0	0	14	38
Totals	2,053	186	2,894	406	2,615	201	8,355	100%	361	101	3,235	12,052

Tables No. 3 and No. 4 give the number and percentage of Fresh and Salt Water nets sold by parish for 1954 and 1955. It also shows the number of Dealers and Agents licensed in each parish. By comparing the two tables you can determine increases or decreases in any particular parish and increases or decreases in any particular class of license shown.

You can also easily determine the relative position of each parish as compared with any or all of the others.

Table No. 5

COMPARATIVE STATEMENT OF FRESH AND SALT WATER COMMERCIAL FISH PRODUCED BY LOUISIANA FISHERMEN

JULY 1ST, 1953 - JUNE 30TH, 1954 WITH JULY 1ST, 1954 - JUNE 30TH, 1955

Fresh Water Fisheries	July 1, 1953—June 30, 1954		July 1, 1954—June 30, 1955	
	Pounds	Value	Pounds	Value
Catfish	7,076,818	$ 2,476,890.00	4,983,008	$ 1,744,050.00
Gaspergou	1,395,008	209,250.00	1,243,814	186,570.00
Spoonbill Cat	557,590	111,520.00	1,140,732	228,150.00
Buffalo	3,221,523	547,660.00	2,470,378	420,540.00
Garfish	1,057,356	132,170.00	932,459	116,560.00
Miscellaneous	821,404	41,070.00	463,509	23,180.00
River Shrimp	54,746	13,690.00	39,147	17,620.00
Turtles	93,011	27,900.00	132,559	39,770.00
Crayfish	241,831	60,460.00	778,394	194,600.00
Frogs	138,653	55,460.00	124,501	49,800.00
TOTAL	14,657,940	$ 3,676,070.00	12,308,501	$ 3,020,840.00
Salt Water Fisheries				
Sea Turtles	17,095	5,130.00	12,343	3,700.00
Speckled Trout	480,889	144,270.00	520,010	162,600.00
Red Fish	183,830	33,090.00	406,881	73,238.00
Sheephead	65,211	6,520.00	96,286	9,630.00
Flounder	217,858	43,570.00	312,282	62,460.00
Red Snapper	89,159	20,510.00	97,588	22,450.00
Mullet	345,372	51,800.00	466,816	70,020.00
Drum	85,328	8,530.00	142,300	14,230.00
Miscellaneous	403,627	40,360.00	298,316	29,830.00
Hard Shell Crabs	7,933,521	396,680.00	12,112,295	605,610.00
Soft Shell Crabs	1,213,962	364,190.00	1,548,269	464,478.00
Crab Meat	205,082	164,070.00	451,613	361,290.00
TOTAL	11,240,934	$ 1,278,720.00	16,464,999	$ 1,879,536.00
Baby Green Turtles —Number	Number 3,895,072	$ 311,600.00	Number 1,652,292	$ 132,180.00
TOTAL FRESH AND SALT WATER FISHERIES	25,898,874	$ 5,266,390.00	28,773,500	$ 5,032,556.00

Since this report is intricate in nature and requires reports from all of the licensed dealers within the State, it is necessary that it be prepared on a fiscal year basis so that it can be completed by the end of the calendar year. Both the 1953-54 and 1954-55 fiscal years show a production evaluation of over $5,000,000.00. These figures show a favorable increase over 1951-52 and 1952-53, which were $3,853,973.07 and $4,282,679.59 respectively.

Accounting section handling routine business.

Table No. 6
MENHADEN PRODUCTION BY UNITS
One Unit—666 pounds (approx. 1,000 fish)

Company	TOTAL UNIT PRODUCTION Louisiana, Mississippi, Texas			LOUISIANA UNIT PRODUCTION		
	3 Year Average 1951-1953	1954	1955	3 Year Average 1951-1953	1954	1955
Louisiana:						
La. Menhaden Co.	101,408	83,497	102,615	101,408	83,497	102,615
Gulf Menhaden Co.	98,151	116,391	125,891	98,151	116,391	125,891
The Quinn Menhaden Fisheries	64,106	71,974	91,639	64,106	71,974	91,639
Empire Menhaden Co.	141,359	134,778	131,704	141,359	134,778	131,704
TOTAL	405,024	406,640	451,849	405,024	406,640	451,849
Mississippi:						
Santos & Robinson	41,862	......	......	31,397	......	......
Tuna, Inc.	20,420	......	......	15,776	......	......
Standard Products Company	......	25,445	19,509	......	25,445	19,509
Fish Meal Company	32,986	44,225	106,733	32,986	44,225	106,733
Wallace M. Quinn Fisheries	55,836	34,864	45,673	43,088	31,378	41,106
TOTAL	151,104	104,534	171,915	123,247	101,048	167,348
Texas:						
Port Arthur Menhaden Products	34,519	37,069	45,764	25,889	31,508	38,899
Quinn Menhaden Fisheries	30,875	36,684	26,320	23,156	31,181	22,372
TOTAL	65,394	73,753	72,084	49,045	62,689	61,271
GRAND TOTAL	621,522	584,927	695,848	577,316	570,377	680,468

	YIELD—LOUISIANA PRODUCTION				PROCESSED VALUE OF LOUISIANA PRODUCTION					
	Gals. Oil at an Average of 8 Gals per Unit		Tons Meal at an Average of .07 Tons per Unit		Oil Value at an Average of $.60 per Gallon		Meal Value at an Average of $130.00 per Ton		Estimated Total Value Oil & Meal	
	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955
La. Companies	3,253,120	3,614,792	28,465	31,629	$1,951,872	$2,168,875	$3,700,450	$4,111,770	$5,652,322	$6,280,645
Miss. Companies	808,384	1,338,784	7,073	11,714	485,030	803,270	919,490	1,522,820	1,404,520	2,326,090
Texas Companies	501,512	490,168	4,388	4,289	300,907	294,101	570,440	557,570	871,347	851,671
TOTAL	4,563,016	5,443,744	39,926	47,632	$2,737,809	$3,266,246	$5,190,380	$6,192,160	$7,838,189	$9,368,406

The unit figures and evaluations for this table were collected from the individual companies shown. The evaluations of Yield and Processed value are average figures as reported by the industry and do not indicate the actual yield or income of any one company.

In the Fifth Biennial Report the Commission presented the Menhaden Industry evaluation in total for three years because it was a new industry and no prior report had been made to use as a comparison. In this Biennial the Commission is showing the average production for the three-year period from 1951-1953 inclusive as compared with the actual production for 1954 and 1955. The Yield and Processed Value Columns are given for 1954 and 1955 Louisiana Waters Unit Production only. If there is a need to find the average yield or processed value for the total unit production or for the three year average of Louisiana Unit production apply the heading figures given in the yield and processed value columns to the first four unit production columns shown in the table.

About sixty-five (65) fishing boats comprise the Menhaden fleet operating in Louisiana waters. These are very large for fishing vessels averaging approximately 100 feet or more in length. The netting methods used are scientific, employing the use of airplanes to spot the schools of Menhaden for the vessels.

Table No. 7
COMPARATIVE TAKES OF FUR ANIMALS IN LOUISIANA

	Number of Pelts Per Year	Average Approximate Price at Point of Severance	Value of Skins to Producer
	1951-1952 SEASON		
Muskrat	1,011.202	$ 1.09	$ 1,102,210.18
Nutria	77,966	2.00	155,932.00
Mink	95,784	9.39	899,411.76
Raccoon	89,353	.55	49,144.15
Opossum	18,017	.24	4,324.08
Otter	4,849	11.05	53,581.45
Skunk	1,062	.34	361.08
Fox	1,181	.45	531.45
Cat	35	.25	8.75
Miscellaneous	33	.28	9.24
TOTAL	1,299,482		$ 2,265,514.14
	1952-1953 SEASON		
Muskrat	1,247,705	$ 1.15	$ 1,434,860.75
Nutria	89,526	2.00	179,052.00
Mink	113,073	10.00	1,130,730.00
Raccoon	63,429	.50	31,714.50
Opossum	12,114	.20	2,422.80
Otter	4,198	11.00	46,178.00
Skunk	982	.50	491.00
Fox	377	.25	94.25
Cat	21	.50	10.50
Miscellaneous	2	.15	.30
TOTAL	1,531,427		$ 2,825,554.10
	1953-1954 SEASON		
Muskrat	1,173,209	$ .80	$ 938,567.20
Nutria	160,654	2.00	321,308.00
Mink	58,706	8.50	499,001.00
Raccoon	49,857	.50	24,928.50
Otter	3,884	13.00	50,492.00
Opossum	6,344	.25	1,586.00
Skunk	311	.25	77.75
Fox	86	.25	21.50
Cat	5	.25	1.25
TOTAL	1,453.056		$ 1,835,983.20
	1954-1955 SEASON		
Muskrat	1,383,114	$ 1.10	$ 1,521,425.40
Nutria	374,199	2.05	767,107.95
Mink	65,170	15.00	977,550.00
Raccoon	84,223	.75	63,167.25
Opossum	7,497	.35	2,623.95
Otter	5,407	16.00	86,512.00
Skunk	120	.50	271.00
Fox	31	.50	60.00
Cat	542	.40	12.40
TOTAL	1,920,303		$ 3,418,729.95

Table No. 8
NUMBER OF FUR LICENSES SOLD

Season	1951-52	1952-53	1953-54	1954-55
Resident Fur Buyer	207	155	163	147
Resident Fur Dealer	36	30	27	21
Non-Resident Fur Buyer	0	0	1	1
Non-Resident Fur Dealer	1	1	1	1
Trapper	6141	4328	4986	5202

Tables Nos. 7 and 8 give a brief picture of the fur industry for the past four seasons. Complete figures for the current season 1955-56 will not be available for several months.

The fur industry in Louisiana has declined rapidly during the past 10 years. Much effort is being put forth to keep this industry alive in our state. For complete details see the Fur and Refuge Division section of this report.

Table No. 9

OYSTER BEDDING GROUND LEASES AND PRODUCTION

Calendar Years	Total Acre of Good Bottoms Susceptible to Culture	Average Acre Per Year Under Lease	Total Barrels Oyster Production Average
1897			295,135
1903		2,821	472,191
1910 and 11	471,962	17,033	661,094
1915 and 16	471,962	20,034	727,820
1924 and 25	477,000	20,205	786,898
1934 and 35	500,000	10,250	823,817
1942 and 43	500,000	17,321	1,128,412
1944 and 45	500,000	18,963	631,366
1946 and 1947 thru 1950-51 (fiscal years)	1,000,000	30,874	624,415
1951	1,000,000	36,277	467,074
1952	1,000,000	41,532	885,717
1953	1,000,000	45,941	793,074
1954	1,000,000	42,341	797,224
1955	1,000,000	43,454	739,517

This table gives the number of acres of Oyster Bedding ground under lease to the producer for the periods shown and the total production in barrels for each period. Actual production figures are given from 1951 through 1955 inclusive. Oyster production has been fairly steady for the past four years showing no unusual increases or decreases. The oyster research program now in progress under the guidance of the Oyster and Waterbottoms Division should prove beneficial to the oyster industry in the future.

Table No. 10

OYSTER AND CLAM SHELL PRODUCTION SEVERANCE TAX AND VALUE TO PRODUCER

Year	Oyster Shells Cubic Yards	Estimated Amount of Severance Tax	Estimated Value to Producer
1936 thru 1941 (Average per yr.—6 year period)	820,992	$ 32,839.68	$1,641,984.00
1942 thru 1946 (Average per yr.—5 year period)	1,298,733	51,949.32	2,597,466.00
1947 thru 1951 (Average per yr.—5 year period)	1,246,257	49,850.28	2,804,078.00
1951	1,816,512	123,718.93	5,449,536.00
1952	1,642,995	113,117.25	4,928,985.00
1953	584,366	62,054.00	1,753,098.00
1954	866,160	88,868.00	2,598,480.00
1955	910,806	146,730.00	2,732,418.00

Year	Clam Shells Cubic Yards	Estimated Amount of Severance Tax	Estimated Value to Producer
1936 thru 1941 (Average per yr.—6 year period)	183,944	$ 9,197.20	$ 367,888.00
1942 thru 1946 (Average per yr.—5 year period)	638,383	31,919.15	1,276,766.00
1947 thru 1951 (Average per yr.—5 year period)	1,014,014	50,700.70	2,281,531.00
1951	1,813,414	123,225.04	5,440,242.00
1952	2,054,926	141,651.32	6,164,778.00
1953	1,506,632	159,567.45	4,519,896.00
1954	1,615,953	165,770.60	4,847,859.00
1955	1,964,050	316,395.36	5,892,150.00

Oyster Shell and Clam Shell production have both shown a steady increase over the past several years. In fact clam production for 1955 is approaching the peak year production reached in 1952. The rate of severance tax has increased more than proportionately to production because the amount collected per cubic yard has been increased from 7½ cents to 12 cents—1955 shows an average collection of more than 12 cents because it includes adjustments from prior periods due to the rate increase.

Table No. 11

TOTAL BARRELS OF VARIOUS TYPES OF PROCESSED SHRIMP MARKETED DURING THE NINE YEARS FROM 1946-1954 AND ONE YEAR 1955 AND VALUE TO THE PRODUCER FOR 1955

	Total 1946-1954	Average 1946-1954	Per Cent	1955	Per Cent	Value to Producer 1955
Whole	484,749.3	53,861.0	13.4	12,487.2	11.6	$ . . . .
Headless	1,754,236.7	194,915.1	48.3	242,421.6	66.3	. . . .
Canned	832,119.8	92,457.7	22.9	48,643.9	13.3	. . . .
Dried	353,139.1	39,237.6	9.7	19,816.9	5.4	. . . .
Cooked & Peeled	205,361.8	22,817.9	5.7	12,172.7	3.4	. . . .
	3,629,606.7	403,289.3	100	365,542.3	100	$23,402,000.00

Shrimp production for 1955 shown in Table No. 11 reflects a sharp decrease compared to the nine years average from 1946-1954. It must be pointed out, however, that 1953 and 1954 were both peak years and, therefore brought the average up considerably. Compare the 1953 and 1954 totals with the 1947-1952 average given in Table No. 12 below. The various types of processed shrimp, such as whole, headless, etc., are reported monthly by the dealers.

Table No. 12

MONTHLY SHRIMP PRODUCTION

	Monthly Average 1941-1952		Monthly Production 1953-1955		
	Six Year Monthly Barrel Average 1941-1946	Six Year Monthly Barrel Average 1947-1952	Monthly Total 1953	Monthly Total 1954	Monthly Total 1955
January	52,312	19,048	17,983	17,476	17,083
February	34,691	18,221	9,223	14,935	12,303
March	19,001	13,558	10,736	6,156	10,320
April	12,591	17,552	25,078	21,248	10,147
May	21,958	36,263	61,356	42,129	30,845
June	37,996	28,804	52,445	49,948	39,132
July	29,907	11,847	25,032	30,429	38,725
August	19,603	45,479	46,882	45,516	45,904
September	60,210	47,835	46,457	50,595	49,544
October	66,999	61,076	71,768	61,293	52,245
November	74,775	44,559	39,999	70,074	34,587
December	68,312	34,998	30,381	41,848	24,707
TOTALS	498,832	379,260	437,340	451,647	365,542

Table No. 12 shows the monthly shrimp production for 1953, 1954 and 1955 as compared with two prior averaged periods. One can easily compare the peak production months of one period with any of the other periods given.

⁂

Chief Accountant Roy B. Shaefer

Table No. 13

SHRIMP PRODUCTION PROCESSED IN EACH AREA
FOR THE YEARS 1954 AND 1955

1954 Area Production	Whole	Headless	Canned	Dried	Cooked & Peeled	Total Bbls.	Per Cent 1954
La. Shrimp Processed in Miss.	....	....	28,478.0	....	....	28,478.0	6.3
French Market	30,637.4	16.6	....	....	....	30,654.0	6.8
N. O. Area, St. Bernard and Plaquemines Parish	4,600.0	21,834.8	29,877.5	1,873.6	....	58,185.9	12.9
Lafourche Parish	9,855.3	77,917.6	480.0	17.7	....	88,270.6	19.5
Terrebonne Parish	11,554.6	35,944.1	29,959.6	25,217.5	13,273.7	115,949.5	25.7
Jefferson Parish	3,775.8	44,629.9	7,286.3	2,300.1	....	57,992.1	12.8
St. Mary and all other Parishes to Texas Line	661.5	67,858.8	2,297.3	....	1.299.0	72,116.6	16.0
	61,084.6	248,201.8	98,378.7	29,408.9	14,572.7	451,646.7	100

1955 Area Production	Whole	Headless	Canned	Dried	Cooked & Peeled	Total Bbls.	Per Cent 1954
La. Shrimp Processed in Miss	....	....	14,323.5	....	....	14,323.5	3.9
French Market	29,225.4	....	....	....	....	29,225.4	8.0
N. O. Area, St. Bernard and Plaquemines Parish	1,034.1	31,890.3	9,873.1	1,431.0	....	44,228.5	12.1
Lafourche Parish	10,366.2	48,765.1	82.5	....	....	59,213.8	16.2
Terrebonne Parish	....	34,642.8	21,440.4	16,780.9	12,172.7	85,036.8	23.3
Jefferson Parish	1,853.0	61,777.7	2,924.4	1,605.0	....	68,160.1	18.6
St. Mary and all other parishes to Texas Line	8.5	65,345.7	....	....	....	65,354.2	17.9
	42,487.2	242,421.6	48,643.9	19,816.9	12,172.7	365.542.3	100

This table gives the area location of the shrimp processing industry in Louisiana and Louisiana shrimp processed in Mississippi. By observing the percentage changes from year to year the Commission can determine which areas are growing and which areas are declining in the shrimp processing industry.

There's always been a waiting line for licenses. Roger Hunter does a proverbial "land office" business in the revenue section.

Table No. 14
SHRIMP PRODUCTION FOR 5 GULF STATES
1954 & 1955

	1954	Per Cent	1955	Per Cent
	Pounds		Pounds	
Florida	....Not.Available	......	13,203,000	
Alabama	2,319,000	......	2,413,000	....
Mississippi	2,652,250	......	5,507,563	....
Texas	42,280,000	......	37,021,000	....
Total	47,251,250	33.3	58,144,563	43.1
Louisiana	94,845,660	66.7	76,763,820	56.9
Total	142,096,910	100.00	134,908,383	100.0

Louisiana produces more than half of the combined production of the five gulf states. The 66.7 per cent shown for 1954 is distorted because production figures for Florida were not available. Assuming Florida's production for 1954 was 15,000,000 pounds, Louisiana's percentage of the 1954 total was approximately the same as that given for the 1955 production.

Table No. 15
SHRIMP PRODUCTION AND NUMBER OF TRAWLS AND/OR SEINES

Calendar Year	No. Barrels Shrimp (210 lbs.)	No. of Seines	No. of Trawls
1913	50,000	131	....
1914	52,381	250	....
1915	57,143	268	....
1916	85,714	....	....
1917	57,143	....	....
1918	71,429	300	17
1919	76,190	....	....
1920	152,381	97	499
1921	163,012	135	983
1922	109,050	111	699
1923	153,749	128	1,021
1924	150,624	143	905
1925	154,722	180	1,010
1926	123,967	143	692
1927	150,896	120	913
1928	195,303	261	1,454
1929	210,033	125	1,486
1930	197,550	172	1,176
1931	178,815	126	1,131
1932	152,373	66	699
1933	166,058	67	1,045
1934	226,576	107	1,441
1935	252,981	125	1,433
1936	286,749	30	1,920
1937	362,942	35	2,313
1938	363,656	13	1,662
1939	395,050	26	1,621
1940	397,189	5	3,016
1941	554,354	5	3,028
1942	489,173	4	2,380
1943	441,445	4	2,101
1944	544,378	4	1,866
1945	495,994	4	2,373
1946	464,981	4	3,030
1947	365,617	4	3,200
1948	376,605	4	3,408
1949	376,040	4	3,310
1950	361,365	3	2,819
1951	396,980	0	2,248
1952	398,952	0	2,277
1953	437,340	10	3,543
1954	451,647	4	3,442
1955	365,542	5	3,276

Table No. 16
NUMBER OF RESIDENT AND NON-RESIDENT TRAWL BOATS BY PARISH AND STATE FOR 1955

Parish	20 feet and under	Over 20 feet thru 35 feet incl.	Over 35 feet thru 45 feet incl.	Over 45 feet	Total
Acadia	0	4	1	1	6
Allen	1	0	0	0	1
Ascension	0	1	1	0	2
Calcasieu	55	15	19	7	96
Cameron	5	30	28	2	65
E. Baton Rouge	1	1	0	0	2
Evangeline	1	0	0	0	1
Iberia	5	36	27	11	79
Jefferson	84	359	121	25	589
Jefferson Davis	1	2	2	0	5
Lafayette	3	3	1	0	7
Lafourche	1	68	142	105	316
Livingston	2	1	0	0	3
Orleans	44	32	41	18	135
Plaquemines ..	6	95	75	10	186
Rapides	1	0	0	0	1
St. Bernard ...	8	61	58	5	132
St. Charles ...	5	20	11	1	37
St. John Baptist	12	2	0	0	14
St. Landry	0	2	0	0	2
St. Martin	0	0	1	0	1
St. Mary	11	34	59	93	197
St. Tammany ..	4	11	4	13	32
Tangipahoa ...	16	24	0	0	40
Terrebonne	17	258	321	61	657
Vermilion	56	56	20	18	150
Washington ...	0	0	0	2	2
W. Feliciana ..	1	0	0	0	1
Total Louisiana	340	1,115	932	372	2,759

State	20 feet and under	Over 20 feet thru 35 feet incl.	Over 35 feet thru 45 feet incl.	Over 45 feet	Total
Alabama	0	3	15	19	37
Florida	0	0	0	7	7
Texas	129	16	26	13	184
Mississippi	3	47	89	150	289
Total Non-Resident	132	66	130	189	517

Table No. 15 is self explanatory and is given to show the progress of shrimp production and trawls in operation since 1913. Although 1953 was a peak year, 1955 had more trawls in operation than the average of the past five years.

Table No. 16 presents the number of resident trawls by Parish and the number of non-resident trawls by state that operated in Louisiana waters during 1955. It also furnishes a division of trawl boats by size so that a clear picture of the average size boat in each area can be seen.

The following tables give a summary of the sport hunting and angling licenses sold for the seasons and years shown. The total sport licenses sold are rapidly approaching the half million mark including both hunting and angling. Table No. 2, which compares the revenue through the calendar year 1955, shows a substantial increase in both angling and hunting revenues as compared to 1954. This would indicate a predicted increase in the 1955-56 hunting and 1955 angling licenses. Figures for these seasons are not as yet available because returns from the parishes are not complete.

Table No. 17
NUMBER OF HUNTING LICENSES SOLD
SEASON 1939-40 to 1954-55, INCLUSIVE

Season	Total Licenses	Hunting Resident $1.00	Hunting Non-Resident $25.00	Hunting Non-Resident 4-Day Trip $5.00
1939–40	98,167	93,587	1,335	3,245
1940–41	116,653	115,336	166	1,151
1941–42	146,648	144,349	495	1,804
1942–43	119,543	118,300	163	1,080
1943–44	94,609	93,334	181	1,094
1944–45	124,485	121,767	407	2,311
1945–46	162,872	160,795	409	1,681
1946–47	170,396	169,652	744	*....
1947–48	176,715	175,482	1,233	*....
1948–49	222,201	221,702	499	*....
1949–50	235,447	234,964	483	1,140
1950–51	235,472	234,195	137	1,140
1951–52	235,855	234,177	192	1,486
1952–53	209,665	207,428	169	2,068
1953–54	251,488	248,496	** 2,992	**....
1954–55	242,456	239,695	** 2,761	**....

NOTE:

* No trip licenses issued during these years

** Non Resident sold on a Reciprocal Basis during the 1953-54 and 1954-55 Seasons. These licenses include both season and trip.

Table No. 18
NUMBER OF ANGLING LICENSES SOLD
YEAR 1939 to 1954 INCLUSIVE

Year	Total	Angling Resident $1.00	Angling Non-Resident $5.00	Angling Non-Resident 7-Day Trip $2.00
1939	27,096	12,649	14,447	**....
1940	31,014	16,140	14,874	**....
1941	52,695	38,080	*14,615	....
1942	41,661	30,608	*11,053	....
1943	36,112	29,492	3,332	3,288
1944	33,239	25,755	3,743	3,741
1945	35,002	27,000	4,088	3,914
1946	52,909	42,621	5,808	4,480
1947	64,055	59,353	4,702	**....
1948	66,797	63,657	3,140	**....
1949	82,942	72,397	5,970	4,575
1950	83,068	72,044	5,872	5,152
1951	89,337	76,516	6,477	6,344
1952	102,715	89,159	6,207	7,349
1953	205,049	178,994	10,087	15,968
1954	217,282	187,832	12,048	17,402

* Includes both annual and 7-day trip.

** No 7-day trip license issued during these years.

Allowing $200.00 for each licensed fisherman and hunter the estimated value of sport equipment is as follows:

Angling Equipment	$43,456,400.00
Hunting Equipment	48,493,200.00
Total Value	$91,949,600.00

Tables Nos. 17 and 18 give the number of hunting and angling licenses sold but are not indicative of the number of participants in these sports. There is a large number of persons who are exempt from the purchase of sport licenses. First of all, persons less than sixteen years of age, both residents and non-residents, are not required to have either license. Second, all residents who are 60 or older and have resided in the state two years prior to application, receive free permanent permits which are used for both hunting and angling. Also all members of the Armed Forces are exempt. This eliminates a large percentage of those participating. Besides these exemptions only residents who fish with a rod and reel or artificial bait are required to have a license.

It is a conservative estimate to say that less than half of the persons who fish for sport in Louisiana are required to have a license. Therefore, our estimated $200.00 average valuation placed on angling equipment for each licensed angler is also conservative and this average would drop considerably if non-licensed persons were taken into consideration.

Not more than three out of every four persons who hunt are required to be licensed. The $200.00 valuation placed on hunting equipment for each licensed hunter is very conservative and would decrease if non-licensed persons were taken into consideration.

Migratory white pelicans sit in marshland potholes.

◆

Table No. 19

LICENSES SOLD BY PARISHES

PARISH	1954 ANGLING			1954-1955 HUNTING		1954-1955 TRAPPING $2.00
	Res. $1.00	N.R. 7-day Trip $2.00	Non-Res. $5.00	Res. $2.00	Non-Res. Reciprocal	
Acadia	1,203	10	3	4,504	14	25
Allen	1,029	20	4	2,953	6	61
Ascension	1,356	10	3	2,519	0	80
Assumption	285	2	0	1,314	1	85
Avoyelles	1,713	423	85	3,923	6	48
Beauregard	1,109	90	62	2,324	19	55
Bienville	489	45	12	1,534	10	35
Bossier	2,394	558	119	2,542	0	24
Caddo	14,046	3,021	2,708	12,670	83	155
Calcasieu	10,523	1,015	2,113	12,662	1,025	151
Caldwell	480	24	0	1,183	0	44
Cameron	792	102	74	1,191	210	142
Catahoula	739	470	161	1,901	13	27
Claiborne	873	48	45	1,546	6	40
Concordia	1,405	1,219	3,091	2,485	168	21
De Soto	697	153	93	1,932	17	87
E. Baton Rouge	17,021	108	49	15,793	25	38
E. Carroll	570	199	122	1,811	38	68
E. Feliciana	295	10	7	1,182	5	26
Evangeline	1,129	192	44	3,576	1	35
Franklin	1,143	49	8	3,701	14	45
Grant	1,034	79	9	1,945	9	51
Iberia	2,787	27	10	4,116	14	91
Iberville	1,042	7	2	2,049	0	33
Jackson	1,200	64	6	2,071	3	43
Jefferson	7,100	0	3	7,733	0	139
Jefferson Davis.	1,559	42	6	3,465	56	140
Lafayette	2,631	18	5	4,977	33	13
Lafourche	2,355	0	1	4,847	0	187
La Salle	1,870	522	56	2,487	2	25
Lincoln	812	31	7	1,911	7	26
Livingston	1,794	139	76	3,225	0	93
Madison	506	89	83	1,817	94	70
Morehouse	1,902	45	24	4,962	10	108
Natchitoches ...	3,113	4,888	863	3,975	109	84
Orleans	47,749	445	599	15,525	251	148
Ouachita	6,126	186	20	9,772	5	71
Plaquemine	543	0	0	1,496	0	158
Pointe Coupee ..	1,253	224	19	2,181	2	9
Rapides	5,891	283	30	9,409	21	85
Red River	384	211	59	1,073	4	59
Richland	1,086	53	18	3,450	5	85
Sabine	630	32	10	2,145	3	49
St. Bernard	1,941	0	0	1,308	0	40
St. Charles	2,023	3	1	2,049	0	96
St. Helena	143	3	6	752	5	15
St. James	447	3	0	1,350	0	92
St. John, Baptist	545	3	2	1,048	0	95
St. Landry	3,835	113	23	8,285	32	67
St. Martin	501	3	3	2,160	0	97
St. Mary	1,956	24	3	3,994	33	272
St. Tammany ..	4,571	172	162	3,446	13	79
Tangipahoa	3,148	181	238	5,629	5	162
Tensas	471	472	266	1,737	54	33
Terrebonne	3,620	44	11	5,433	5	374
Union	564	35	46	2,218	8	56
Vermilion	1,168	7	5	4,419	272	340
Vernon	1,396	336	125	2,555	13	67
Washington	2,293	33	201	4,960	16	48
Webster	2,919	372	164	3,795	3	77
W. Baton Rouge	1,757	9	0	1,149	0	4
W. Carroll	538	61	6	2,582	11	75
W. Feliciana ..	146	1	3	736	0	7
Winn	1,192	374	74	2,213	2	47
	187,832	17.402	12,048	239,695	2,761	5,202
Total Sold: 1953 & 1953-54..	178,994	15,968	10,087	248,496	2,992	4,986
Increase:	8,838	1,434	1,961	....	....	216
Decrease	....	....	....	8,801	231	....
% Increase	4.9%	9%	19.5%	....	....	4.3%
% Decrease	....	....	....	3.5%	7.7%	....

Table No. 19 is prepared each year by the Revenue Section as soon as returns for these classes of licenses are complete. This table not only presents angling and hunting statistics, but also includes the number of trapping licenses sold by each parish. These are the only classes of licenses which are sold within the state at locations other than the main office in New Orleans. Except in Orleans Parish, the Sheriff's Office in each parish is responsible for the distribution and collection of the receipts from the sale of these licenses.

From this table one can readily determine sports activities in any one parish as compared with any or all of the other parishes.

The Accounting records which follow are self explanatory and give a complete presentation of operations by divisions for the 1954-55 fiscal year and our estimated operations for the 1955-56 fiscal year now in progress.

In summary it can readily be seen that the Accounting Section is so closely allied with all of the divisions of the Louisiana Wild Life and Fisheries Commission that it is more a part of each than a separate section.

LOUISIANA WILD LIFE & FISHERIES COMMISSION

Financial Statements for the Fiscal Year 1954-1955 and 1955-1956

1. Operating Account
2. Pittman-Robertson (Federal Projects) Fund Account
3. Dingell-Johnson (Federal Projects) Fund Account
4. Oyster Seed Ground Account
5. Commercial Seafood Division Account
6. Rockefeller Refuge Fund Account
7. Water Hyacinth Control, Act 456 of 1954
8. Study of Noxious Weeds, Act 457 of 1954
9. Special Funds—Operating Account
10. Civil Fees for Law Violations
11. Revenue Collections for the Account of Louisiana State Treasury

1. OPERATING ACCOUNT

Means of Financing:	Actual 1954-55	Estimated 1955-56
State Appropriation	$ 2,008,213.00	$ 1,852,296.00
Act 25 of 1952—Enforcement Division share of ½ of Resident Hunting License Collections	176,000.00	176,000.00
	$ 2,184,213.00	$ 2,028,296.00

Analysis of Expenditures by Units:

DIVISION OF ADMINISTRATION:

Class of Expenditures:	Actual 1954-55	Estimated 1955-56
Salaries	$ 102,846.63	$ 129,631.00
Contractual Services	35,153.03	65,296.00
Traveling Expenses	12,557.23	20,000.00
Material & Supplies	32,427.94	32,160.00
Special Current Charges	5,649.62	74,000.00
Equipment—Capital Outlay	218,489.25	34,665.00
Grand Total of Expenditures	$ 407,123.70	$ 355,752.00

DIVISION OF EDUCATION AND PUBLICITY:

Class of Expenditures:	Actual 1954-55	Estimated 1955-56
Salaries	$ 49,351.62	$ 50,824.00
Contractual Services	58,300.15	61,160.00
Traveling Expenses	4,025.52	7,499.00
Materials & Supplies	7,796.55	8,247.00
Special Current Charges	2,863.30	....
Equipment—Capital Outlay	9,388.00	5,786.00
Grand Total of Expenditures	$ 131,725.14	$ 133,516.00

DIVISION OF RESEARCH & STATISTICS:

Class of Expenditures:	Actual 1954-55	Estimated 1955-56
Salaries	$ 51,558.90	$ 54,164.00
Contractual Services	6,025.49	3,092.00
Traveling Expenses	8,970.29	9,076.00
Materials & Supplies	6,890.77	11,208.00
Special Current Charges	2,218.57	....
Equipment—Capital Outlay	14,815.42	10,108.00
Grand Total of Expenditures	$ 90,479.44	$ 87,648.00

DIVISION OF ENFORCEMENT:

Class of Expenditures:	Actual 1954-55	Estimated 1955-56
Salaries	$ 518,430.75	$ 585,301.00
Contractual Services	22,115.43	11,537.00
Traveling Expenses	169,021.87	195,857.00
Materials & Supplies	63,207.70	78,891.00
Special Current Charges	30,080.98	....
Equipment—Capital Outlay	96,996.69	42,826.00
Grand Total of Expenditures	$ 899,853.42	$ 914,412.00

DIVISION OF OYSTERS AND WATER BOTTOMS:

Class of Expenditures:	Actual 1954-55	Estimated 1955-56
Salaries	$ 40,035.11	$ 44,690.00
Contractual Services	8,680.31	7,345.00
Traveling Expenses	4,001.59	4,816.00
Materials & Supplies	12,877.36	9,549.00
Special Current Charges	17,353.78	....
Equipment—Capital Outlay	26,097.44	1,000.00
Major Repairs	2,238.00	....
Grand Total of Expenditures	$ 111,283.59	$ 67,400.00

DIVISION OF FISH & GAME:

Class of Expenditures:	Actual 1954-55	Estimated 1955-56
Salaries	$ 95,909.05	$ 182,828.00
Contractual Services	13,673.03	10,238.00
Traveling Expenses	16,285.32	37,715.00
Materials & Supplies	48,687.38	40,723.00
Special Current Charges	4,121.79	....
Equipment—Capital Outlay	85,204.06	28,676.00
Land & Construction	2,071.66	3,400.00
Grand Total of Expenditures	$ 265,952.29	$ 303,580.00

DIVISION OF FUR & REFUGE:

Class of Expenditures:	Actual 1954-55	Estimated 1955-56
Salaries	$ 56,374.65	$ 59,641.00
Contractual Services	7,674.05	10,599.00
Traveling Expenses	9,176.93	12,580.00
Materials & Supplies	18,465.89	29,672.00
Special Current Charges	3,020.78	....
Equipment—Capital Outlay	31,631.70	30,190.00
Major Repairs	....	16,306.00
Land & Construction	19,091.53	7,000.00
Grand Total of Expenditures	$ 145,435.53	$ 165,988.00

2. PITTMAN-ROBERTSON FUND ACCOUNT

Means of Financing:	Actual 1954-55	Estimated 1955-56
Balance Surplus (State share) 6-30-54	$ 67,894.28	$ ....
Federal Allotment 75%	203,952.84	....
Balance Surplus (State share) 6-30-55	....	64,273.41
Federal Allotment 75%	....	192,820.23
State Appropriation 25%	65,000.00	70,000.00
Federal Allotment 75%	195,000.00	210,000.00
	$ 531,847.12	$ 537,093.64

Class of Expenditures:	Actual 1954-55	Estimated 1955-56
Salaries	$ 141,996.03	$ 146,090.00
Contractual Services	23,523.82	23,439.00
Traveling Expenses	6,155.26	13,963.00
Materials & Supplies	38,769.95	54,375.00
Special Current Charges	6,847.24	7,563.00
Equipment—Capital Outlay	42,344.69	34,570.00
	$ 259,636.99	$ 280,000.00

3. DINGELL-JOHNSON FUND ACCOUNT

Means of Financing:	Actual 1954-55	Estimated 1955-56
Balance Surplus (State share) 6-30-54	$ 13,489.92	$ ....
Federal Allotment 75%	40,469.76	....
Balance Surplus (State share) 6-30-55	....	21,551.60
Federal Allotment 75%	....	64,654.80
State Appropriation 25%	20,777.13	20,000.00
Federal Allotment 75%	62,331.40	60,000.00
	$ 137,068.21	$ 166,206.40

Class of Expenditures:	Actual 1954-55	Estimated 1955-56
Salaries	$ 29,993.69	$ 57,192.00
Contractual Services	2,281.33	4,915.00
Traveling Expenses	5,566.33	10,920.00
Materials & Supplies	8,940.35	12,880.00
Special Current Charges	1,119.98	2,020.00
Equipment—Capital Outlay	6,554.77	18,212.00
	$ 54,456.45	$ 106,139.00

4. OYSTER SEED GROUND ACCOUNT

Means of Financing:	Actual 1954-55	Estimated 1955-56
Dedicated Revenue to the establishment of Oyster Seed Grounds and to the planting, propagation, cultivating, policing, preservation and distribution of oysters as set forth in Act 533 of 1950, Section 458, ½ Tax on shells taken from State owned Waterbottoms (less part due and transferred to Commercial Seafood Division)	$ 181,097.22	
	$ 181,097.22	

Means of Financing:	Actual 1954-55	Estimated 1955-56
Cash Balance Fiscal year ending June 30, 1954	$ 76,515.29	
Revenues Fiscal year ending June 30, 1955	181,097.22	
	$ 257,612.51	
Expenditures Fiscal year ending June 30, 1955	$ 110,581.00	
	$ 147,031.51	
Estimated Revenues Fiscal year ending June 30, 1956	$ 245,000.00	
	$ 392,031.51	
Estimated Expenditures Fiscal year ending June 30, 1956	$ 146,200.00	
Unencumbered Balance June 30, 1956 estimated	$ 245,831.51	

Analysis of Expenditures: Class of Expenditures:	Actual 1954-55	Estimated 1955-56
Salaries	$ 47,541.05	$ 61,200.00
Contractual Services	6,845.37	5,400.00
Traveling Expenses	8,205.24	7,400.00
Materials & Supplies	24,983.68	30,200.00
Special Current Charges	2,767.57	2,800.00
Equipment—Capital Outlay	20,238.09	39,200.00
Grand Total of Expenditures	$ 110,581.00	$ 146,200.00

5. COMMERCIAL SEAFOOD DIVISION ACCOUNT

Means of Financing:	Actual 1954-55	Estimated 1955-56
Dedicated Revenues to the Administrative and Enforcement of commmercial seafood Laws as set forth in Act 533 of 1950, Section 458, ½ Tax on shells taken from state owned water bottoms	$ 170,222.72	
	$ 170,222.72	
Cash Balance Fiscal year ending June 30,1954	$ 8,330.88	
Revenues Fiscal year ending June 30, 1955	170,222.72	
	$ 178,553.60	
Expenditures Fiscal year ending June 30, 1955	$ 125,037.61	
	$ 53,515.99	
Estimated Revenues Fiscal year ending June 30, 1956	$ 245,000.00	
	$ 298,515.99	
Estimated Expenditures Fiscal year ending June 30, 1956	$ 133,410.00	
Unencumbered Balance June 30, 1956	$ 165,105.99	

Analysis of Expenditures:

Class of Expenditures:	Actual 1954-55	Estimated 1955-56
Salaries	$ 61,196.55	$ 54,000.00
Contractual Services	7,725.89	8,800.00
Traveling Expenses	9,167.93	3,600.00
Materials & Supplies	30,673.35	57,600.00
Special Current Charges	3,707.64	2,210.00
Equipment—Capital Outlay	12,566.25	7,200.00
Grand Total of Expenditures	$ 125,037.61	$ 133,410.00

6. ROCKEFELLER REFUGE FUND ACCOUNT

Means of Financing:

Funds received from Rockefeller Lease for improvements to Rockefeller Refuge.	
Cash Balance Fiscal year June 30, 1954	$ 926,795.99
Appropriation Fiscal year ending June 30, 1955	465,000.00
Fur Sales Rockefeller Refuge	4,737.79
	$1,396,533.78
Expenditures Fiscal year ending June 30, 1955	$ 1,185,765.89
	$ 210,767.89
Appropriation Fiscal year ending June 30, 1956	$ 535,000.00
Receipts Fiscal year ending June 30, 1956	34,800.00
	$ 780,567.89
Estimated Expenditures Fiscal year ending June 30, 1956	$ 780,567.89

Analysis of Expenditures:

Class of Expenditures:		
Salaries	$ 176,635.83	$ 159,400.00
Contractual Services	175,217.39	8,400.00
Traveling Expenses	9,604.84	12,000.00
Materials & Supplies	75,361.46	65,400.00
Special Current Charges	5,866.66	6,200.00
Equipment—Capital Outlay	73,825.70	34,200.00
Major Repairs	1,248.22	....
Land & Construction	668,005.79	494,967.89
	$ 1,185,765.89	$ 780,567.89

7. WATER HYACINTH CONTROL ACT 456 OF 1954

	Actual 1954-55	Estimated 1955-56
Means of Financing:		
Special State Appropriation	$ 150,000.00	$ 100,000.00
Analysis of Expenditures:		
Class of Expenditures:		
Salaries	$ 50,876.99	$ 57,398.00
Contractual Services	2,278.62	3,253.00
Traveling Expenses	5,470.23	12,697.00
Materials & Supplies	56,680.60	16,255.00
Special Current Charges	3,014.42	3,428.00
Equipment—Capital Outlay	29,188.62	6,969.00
Grand Total of Expenditures	$ 147,509.48	$ 100,000.00

8. STUDY OF NOXIOUS WEEDS ACT 457 OF 1954

Means of Financing:		
Special State Appropriation	$ 25,000.00	$ 25,000.00
Analysis of Expenditures:		
Class of Expenditures:		
Salaries	$ 5,696.90	$ 8,000.00
Contractual Services	160.35	450.00
Traveling Expenses	1,122.59	1,200.00
Materials & Supplies	7,642.67	10,950.00
Special Current Charges	319.90	400.00
Equipment—Capital Outlay	9,179.62	4,000.00
Grand Total of Expenditures	$ 24,122.03	$ 25,000.00

9. SPECIAL FUNDS—OPERATING ACCOUNT

	Revenues Actual 1954-55	Revenues Estimated 1955-56	Expenditures Actual 1954-55	Expenditures Estimated 1955-56
Bayou Lamoque	$100,000.00	$ 50,000.00	$ 1,645.00	$ 148,355.00
Bayou Terre Aux Boeufs	100,000.00	....	....	100,000.00
Marsh Island Improvement		135,000.00		135,000.00
Building Fund		1,000,000.00		1,000,000.00
Furniture & Fixtures (General Fund)		200,000.00		200,000.00
Fur Sales, Pasturage, Marsh Island	9,313.31	9,500.00		
Fur Sales—State Wildlife	7,654.00	8,000.00		
Fur Sales, Pasturage and Permit Fees—Pass-a-Loutre	981.10	4,000.00	677.09	
Act 25 of 1952—Section 104	$236,987.00	$ 240,000.00	$241,006.13	$ 233,998.00

10. CIVIL FEES FOR LAW VIOLATIONS

Fees Collected and Transmitted to the Following Parish School Boards During Fiscal Year 1954-55

Acadia Parish	$ 262.50
Allen Parish	337.50
Ascension Parish	50.00
Assumption Parish	425.00
Avoyelles Parish	2,234.70
Beauregard Parish	252.50
Bienville Parish	736.94
Bossier Parish	712.50
Caddo Parish	1,850.00
Calcasieu Parish	1,305.00
Caldwell Parish	100.00
Cameron Parish	237.50
Catahoula Parish	687.50
Claiborne Parish	513.00
Concordia Parish	562.50
DeSoto Parish	450.00
East Baton Rouge Parish	325.00
East Feliciana Parish	362.50
Evangeline Parish	350.00
Franklin Parish	212.50
Grant Parish	621.92
Iberia Parish	762.50
Iberville Parish	211.90
Jackson Parish	175.00
Jefferson Parish	975.00
Jefferson Davis Parish	250.00
Lafayette Parish	425.00
Lafourche Parish	900.00
LaSalle Parish	237.50
Lincoln Parish	225.00
Livingston Parish	2,422.90
Morehouse Parish	37.50
Natchitoches Parish	789.37
Ouachita Parish	561.90
Plaquemine Parish	187.50
Pointe Coupee Parish	787.50
Rapides Parish	2,037.50
Red River Parish	362.50
Richland Parsih	437.50
Sabine Parish	175.00
St. Bernard Parish	75.00
St. Charles Parish	1,337.50
St. Helena Parish	199.50
St. James Parish	537.50
St. John the Baptist Parish	900.00
St. Landry Parish	1,487.00
St. Martin Parish	987.50
St. Mary Parish	212.50
St. Tammany Parish	3,112.50
Tangipahoa Parish	1,899.72
Terrebonne Parish	387.50
Union Parish	300.00
Vermilion Parish	825.00
Vernon Parish	312.50
Washington Parish	1,362.50
Webster Parish	425.00
West Baton Rouge Parish	137.50
West Carroll Parish	25.00
West Feliciana Parish	375.00
Winn Parish	125.00
	$39,573.85

11. REVENUE COLLECTIONS FOR THE ACCOUNT OF THE LOUISIANA STATE TREASURY:

	Actual 1954-55	Estimated 1955-56
Severance Tax		
Gravel	$ 1,540.77	$ 500.00
Sand	1,862.06	1,800.00
Skins, Hides & Furs	13,039.06	24,000.00
Oyster Privilege	14,946.75	15,000.00
Shrimp	75,400.23	75,000.00
Frogs	143.74	....
Licenses		
Angling Licenses	46,482.00	47,500.00
Hunting Licenses	17,459.75	17,500.00
Hunting Club	930.00	900.00
Commercial Fishermen, Bait Sellers	14,340.00	15,000.00
Hoop Nets	10,165.00	11,500.00
Fresh Water Commercial Seines	2,480.00	3,500.00
Fresh Water Commercial Trammel Nets	4,025.00	3,500.00
Fresh Water Commercial Gill Nets	26,455.00	27,000.00
Salt Water Fish Seines	535.00	550.00
Salt Water Fish Trammel Nets	1,760.00	1,800.00
Wholesale Fish Dealers	20,000.00	21,000.00
Wholesale Fish Dealers Agents	1,010.00	1,000.00
Retail Dealers	16,390.00	17,000.00
Oyster Tonnage (vessel)	1,314.50	1,500.00
Salt Water Fish Vessel	340.00	350.00
Salt Water Menhaden Vessel	3,350.00	3,500.00
Oyster Dredging	7,550.00	8,000.00
Salt Water Shrimp Trawl & Vessel	48,505.00	50,000.00
Salt Water Shrimp Seine	40.00	50.00
Salt Water Seine Menhaden	3,350.00	3,500.00
Salt Water Shrimp Freight	2,330.00	2,500.00
Game Breeders	440.00	500.00
Trappers	373.00	350.00
Resident Fur Buyers	3,675.00	3,500.00
Resident Fur Dealers	3,150.00	3,000.00
Non-Resident Fur Buyers	100.00	100.00
Non-Resident Fur Dealers	300.00	300.00
Bedding Ground	39,879.00	40,000.00
Oyster Shop, Resale	1,025.00	1,100.00
Oyster Transfer at Lease Fees	14.00	20.00
Total Revenues Collected Through New Orleans and Biloxi Offices	$ 384,699.86	$ 402,320.00
Remitted by Sheriff's and State Land Office		
Angling Licenses	$ 214,142.16	$ 220,000.00
Hunting Licenses	206,778.13	210,000.00
Trappers Licenses	9,339.63	9,000.00
Royalties from Mineral Leases—Oil	537,494.16	635,000.00
Royalties from Mineral Leases—Sulphur	391,542.65	400,000.00
Mineral Leases—Oil		1,990,600.00
Total Remitted Sheriff's and State Land Office	$ 1,359,296.73	$ 3,464,600.00
GRAND TOTALS	$ 1,743,996.59	$ 3,866,920.00